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This chapter, published as part of an extensive report on an experimental college program for low-achieving students, provides a comprehensive review of recent research literature related to low-achievers. Organized into several sections, the review deals with literature on identifying over-and under-achievers, factors related to achievement and under-achievement, predicting achievement, and experimental efforts to improve achievement. Also discussed is literature concerned with academic achievement, college admissions policy, and attrition in higher education. A lengthy bibliography is presented. (For other chapters of this report, see UD 005309, UD 005310, UD 006860, and UD 006861) (LB)

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Southern Illinois University

A TWO-YEAR REPORT ON THE EXPERIMENTAL FRESHMAN YEAR PROGRAM

CHAPTER II

A REVIEW OF RESEARCH LITERATURE CONCERNING LOW ACHIEVERS

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SOUTHERN ILLINOIS UNIVERSITY

Experimental Freshman Year Program
September 1, 1964

CHAPTER II

A REVIEW OF RESEARCH LITERATURE CONCERNING LOW ACHIEVERS

The purpose of this chapter is to present a summary of major findings relevant to the concept of academic achievement at the college level. Academic achievement and academic under-achievement are primary concerns of those involved in all phases of education. Individual philosophical and experimental research dealing with achievement has been reported in the educational literature for some time. Several comprehensive reviews of the literature over the last few decades are also available (Heist, 1960; Bower and Holmes, 1959; Fishman and Pasanella, 1960; Peterson, 1963; Raph and Tannenbaum, 1961; Taylor, 1964; Waller, 1964). This report on the literature is not intended to be a historical survey. Rather, it is limited mainly to the research and literature published in the late 1950's and 1960's and principally to studies which are empirical in nature.

Organization of Chapter

The literature summary has been organized into several sections. The first section in this chapter is concerned with literature relating to problems of identifying over- and under-achievers, investigations of achievement and "natural ability," sources of error, and methods of control. The next section deals with problems of predicting academic success; it includes articles exploring the effectiveness of a variety of measures and predictors in addition to discussion of validity and reliability.

Section three considers the concept of under-achievement and the general factors found to be related to achievement. The nature of under-achievers and the non-intellective factors affecting achievement are included. Succeeding parts of the section also give special attention to research relating creativity; motivation and level of aspiration, personality factors, anxiety and adjustment, demographic factors, family and parental attitudes; and socio-economic status and cultural factors to academic achievement. The fourth section takes up those studies reporting actual treatments or experimental conditions which have been applied to students in a variety of situations in an effort to raise their level of achievement. These treatments reported are remedial teaching, curriculum, ability grouping, counseling and interviewing, and a variety of in-classroom manipulations, ranging from variations in instructor method to programmed instruction to instructional media. The fifth section of the review of the literature is composed of selected articles dealing with admission policies and the influences of research on these policies. The final section examines research on the problem of attrition in higher education.

Limitations of Literature Review

Some of the limitations or qualifications of this review of the literature should be stated to assist the reader in his interpretation of the summary findings reported in this chapter. First, because most of the studies were conducted in ongoing educational settings, stringent experimental controls were not exercised in most of the research studies reported.

Second, many studies involve no experimental manipulations but merely consist of correlations between various sets of test scores. Third, because there are very few studies in which the research conditions were reported, it is difficult to ascertain the merits of the findings.

However, these qualifications do not disparage the quality of the research effort. Most investigators were well aware of the problems they faced in this regard and made conscientious efforts to report limitations of the studies. Where it was not possible to account for important variables, most writers were careful to acknowledge this and to suggest errors which may have occurred in the findings. In those situations where it was not possible to hold relevant variables constant, matching techniques were frequently employed. In many cases various means of statistical control were brought to bear where possible.

Identifying Over- and Under-Achievers

There seems to be agreement among educational researchers regarding the general meaning of over- and under-achievement. Farquhar and Payne (1964) offer a straightforward and concise definition: "An over-achiever exceeds an aptitude-based expectancy of academic performance. Conversely, an under-achiever falls below his expected performance." However, as individual researchers operationally define achievement, agreement disappears. Investigators seem to assume that as long as their samples are chosen from among the most extreme cases in a particular population the samples will contain what they expect them to contain, irrespective of the criterion measures employed.

There is insufficient standardization in research in achievement relative to operational definitions and procedural reporting. Researchers appear to have selected criterion groups with little concern for those operational definitions and sample selection criteria specified by other researchers in the field. Farquhar and Payne note that most authors do not report the procedures used to identify under- and over-achievers. Such research reporting makes it difficult for conscientious researchers to replicate sample selection criteria and procedures.

The underlying assumption in much of the research dealing with under- and over-achievers seems to be that the characteristics of the under-achiever are obvious and easily identified and that any combination of recognized ability and achievement measures will result in a valid sample of the under-achiever population. Actually, research suggests that this assumption is invalid and that criteria choice and sophistication of statistical technique are critical factors in identifying over- and under-achievers.

Two studies (Pippert and Archer, 1963; Farquhar and Payne, 1964) present data which support the contention that this assumption is false. Over- and under-achievers do not constitute stable and homogeneous groups in the general population of students. Specific qualities of the sample being studied, the criterion for assessing achievement, and the sophistication of statistical procedures used in analyzing data make critical differences in the number of subjects which will show discrepancies extreme enough to be included in the deviant groups. More important, application of these factors also seriously alters the actual composition of criterion groups. Different methods and operational definitions select different people as over- and under-achievers.

The following two articles are described in detail in order to show how samples, criteria, and statistical procedures operate on actual data.

It is shown that even given the same data, different operational definitions and procedures yield different results. Because operational definitions and selection criteria are rarely the same and because specifics of each selection method are not described to permit proper adjustment for sample differences, it is extremely difficult to make generalizations from one study to another.

Pippert and Archer (1963) administered an intelligence measure, the Otis Test of Mental Ability, to 250 members of a ninth grade class in a Massachusetts high school. Then two measures of achievement, grade point average (GPA) and the score on the Iowa Test of Educational Development (ITED), were obtained for the same subjects. Comparable minimum levels of achievement for each criterion were established. Subjects were then classified as under-achievers on the basis of each of the established minimum achievement criterion levels. Except for an overlap of two students, entirely different groups were selected by the two methods of classifying the subjects as under-achievers.

Moreover, the same study showed that the two groups of under-achievers differed in a number of other ways. First, subjects identified by their GPA as under-achievers scored significantly higher on the Otis than both the achiever group ($p = .05$) as identified by GPA, and the other under-achiever group ($p = .01$), as identified by the ITED. Second, under-achievers as identified by GPA were significantly lower than the achievers as identified by GPA ($p = .001$) and Correctness and Appropriateness of Expression as measured on the ITED ($p = .05$); but on all other measures reported, there were no significant differences when the achiever group and the under-achiever group as identified by GPA were compared. Third, the under-achievers identified by the ITED scored significantly lower than the achievers and the group of under-achievers, as identified by GPA, on all measures except GPA. It is interesting to note that the Correctness and Appropriateness of Expression measure is the only indicator used which discriminates both under-achiever groups from the achiever group.

An adjective checklist administered to all subjects revealed a fourth difference. Significant differences were found between the responses of the two groups of under-achievers on the adjective checklist. Those identified by GPA described themselves by such words as "intelligent" and "honest," while those identified by the ITED chose such words as "cheerful" and "friendly."

The authors of the study suggest a number of interesting implications from these findings. For example, the authors state that students identified as under-achievers by the ITED may be rewarded for personality characteristics which ingratiate them with their teachers and compensate for their lack in actual academic achievement. The net result would be that the students' grades would not necessarily suffer due to their lack of achievement. Conversely, the other group may be penalized for a lack in these personality characteristics. The results on the adjective checklist corroborate these speculations. Since the GPA under-achievers are significantly higher on the Otis, the authors also suggest the possiblity that these students are given lower grades than their classroom performance warrants because their teachers have higher expectations for them.

The findings from the study by Pippert and Archer (1963) support the contention that the operational definition and the subsequent selection of criteria are important factors for identifying over- and under-achievers.

Farquhar and Payne (1964) also support this contention, presenting a comparison of different techniques used in selecting over- and under-achievers. The analysis by these authors is principally statistical in nature but offers conclusions similar to those found in the previous study. The selection techniques for identifying over- and under-achievers are classified into four main types.

The first type is the "central tendency split technique." This method simply determines the means for the students on ability and achievement measures; the students falling below the mean on achievement and in the upper quartile in ability are selected as under-achievers. Over-achievers are identified as students falling above the mean on achievement and in the lower quartile in ability.

The second technique is called "arbitrary partitions--middle group eliminated." This method selects only those whose scores fall at opposite extreme ends of the distributions for ability and achievement. Thus any student who scored in the middle range on either measure would not be selected.

Third, the authors discuss the "relative discrepancy splits technique." In this method, grade point average and ability measures are ranked independently, and over- and under-achievers are selected by an arbitrarily determined discrepancy in ranks. This method abandons the notion that absolute levels of performance are to be implied from scores on ability measures, but recognizes the relative association of ability with actual achievement.

The fourth type of procedure discussed is a "regression model selection." This technique also modifies the concept of parallelism between aptitude and achievement measures, but still attempts to use realistically the predictive power of the ability scale at the interval level of measurement. As the title implies, this method involves computing a regression equation to predict achievement from ability measures for the full range of scores. Over- and under-achievers are then designated as those falling a specified distance (i.e., one standard deviation) from the regression line. Several more complicated versions of this procedure make use of some of the techniques mentioned earlier in combination with the regression equation. The authors report that DuBois (1948)

> has presented a framework supportive of the contention that a properly constructed ratio such as that of the actual to the predicted grade-point achievement approximates the residual variance remaining after partialing out the common variance between aptitude test and course grades.

However, the authors reported they were unable to find any study employing this technique or explaining it any further.

Having reviewed techniques which have been used in the past, Farquhar and Payne (1964) then suggest criteria which an ideal method of selection should employ. This outline serves to illustrate the multitude of problems which the researcher in under-achievement faces before beginning to consider any other variables. The authors suggest the following criteria which an ideal method of selecting over- and under-achievers should employ.

A. The achievement criterion should:
    1. be academic--not contaminated with activity courses.
    2. take under consideration differences in grading systems of various schools.

B. The aptitude predictor should:
    1. be heavily loaded with valid and reliable academic predictor factors.
    2. be a stable estimate as free as possible from such spurious effects as:
        a. chance high scores by low achieving non-readers.
        b. chance low scores due to confusion in test administration or poor test motivation.

C. The selection model should:
  1. represent the full range of achievement and ability.
  2. be built separately for the two sexes.
  3. classify the criterion groups with a minimum chance of overlap.
  4. preferably meet the assumptions of a parametric statistic.
  5. control on regression effects.

Farquhar and Payne (1964) have designed and tested a model sample selection method in attempting to follow their criteria. Two ability measures were administered one year apart to eliminate (a) those students who showed erratic behavior in the test situation and (b) those who were more than one standard deviation away from the regression line computed for the two measures. Eliminating these subjects yielded a correlation of .90 between ability measures. Then regression lines were computed for the reduced sample for each aptitude measure with the achievement criterion, grade point average in selected academic subjects. The ability measure yielding the highest correlation value was selected as the predictor. Under- and over- achievers were defined as those falling at least one standard error below and above the regression line, respectively.

Then, using the same random sample of 100 male and 100 female tenth grade students at a Michigan high school, the same authors applied each of the previously described techniques, including their own, to determine the number and the identity of students who would be selected as under- and over-achievers by each of the five techniques.

Analysis of this effort substantiates the findings reported by Pippert and Archer (1963). The DuBois (1948) and Farquhar and Payne (1964) methods selected similar groups in all categories, but with this exception: there was little or no correspondence between individuals selected. There was wide variation in the absolute number selected, and there were significant differences in the relative numbers of males and females selected. Pippert and Archer also noted this latter effect.

The authors conclude with the urgent appeal to researchers to report their methods in such a way that replication is possible. A final implication "relates to the broader problem of research communication. It is obvious that a dire need exists to adopt standard definitions of the procedures for identifying discrepant achievers."

Measurement Problems in Identifying Achievement

This section deals with two matters. First, the general problems related to measuring over- and under-achievers are discussed. Second, specific examples of problems related to measuring ability and personality in relation to achievement are examined in four studies.

One of the most recent attempts to examine the measurement problems in identifying over- and under-achievers has been made by Thorndike (1963). Thorndike sees measurement error, and the distortion it casts on the identification of over- and under-achievers, as a crucial research problem. Error of measurement, as Thorndike defines it, is that part of any test performance which represents the operation of variables other than the abstract concept which the given test purports to measure. These measurement errors are sometimes reported to be "chance errors." Such variables contributing to chance errors might be the specific nature of the task required or any of several variables affecting the subject at the particular time the test is administered. On any non-standardized test, such as a classroom test, lack of control, validity, and reliability of the test and in the testing situation increase the possibility of such error. Thorndike shows that significant numbers of "under-achievers" may be identified by the error of measurement alone.

Equal in importance to the error of measurement described above, Thorndike reports, is the systematic error or bias introduced by the "regression effect." The regression effect is illustrated in the case in which a group of subjects is selected on the basis of a low score on an aptitude test and then do better on their achievement criterion. Thorndike states the subjects regress up, "toward the average value of the group." To correct this problem Thorndike suggests "under-achievement" be defined as the "discrepancy of actual achievement from the predicted value, predicted on the basis of the regression equation between aptitude and achievement."

Thorndike is also concerned with the problem of heterogeneity in the criterion variable. Equal appearing scales, such as grades or even standardized achievement tests, will have very different meanings according to the reference point from which they were derived. For example, a "C" grade from Harvard may represent more in the way of actual achievement than an "A" from a hypothetical Podunk State Teachers College where academic standards are very low.

Similarly, the type of curriculum used as a basis for the criterion measure may be critical. Grades in "activity" courses such as home economics or art cannot be presumed to have the same meaning as grades in academic courses. Thorndike offers an example of a study which found most "under-achievers" enrolled in liberal arts or engineering and most "over-achievers" enrolled in agriculture or education. "What this particular study demonstrated, in part, was that academic standards are higher and the intellectual demands more severe in a school of engineering than in a school of agriculture or education." Different scales should be used for predicting achievement for students coming from different educational backgrounds and pursuing different curricula.

The need for eliminating the spurious over- and under-achievers from criterion groups is insightfully examined by Thorndike. The author fails to point out, however, that errors of measurement attributable either to statistical procedural inadequacy or to heterogeneity of the criterion variable, excluding the regression effect, may also account for many individuals' being falsely identified as normal achievers when they are in fact under- or over-achievers. It is necessary to examine Type I as well as Type II statistical errors in measurement procedures for identifying over- and under-achievers.

In summary, the principal matters of concern in the measurement process related to identifying over- and under-achievers have been clarified by Thorndike (1963). Errors of measurement and homogeneity of the criterion are two primary problems associated with measurement problems in identifying over- and under-achievers. Thorndike urges that the above problems in measurement be considered and dealt with adequately before investigation into other variables affecting achievement can reasonably proceed. Virtually the same things set out by Farquhar and Payne in their outline of an ideal selection model are stressed by Thorndike.

The last part of this section reports four studies which demonstrate some of the specific problems related to measuring various factors associated with achievement.

The first two studies deal with the problem of the impact of verbal-quantitative ability on measuring achievement. At least two scales, a verbal scale and a non-verbal scale, are now found almost universally in standardized tests of ability. Gunderson and Feldt (1960) studied the possible effects of differential abilities on achievement in a group of children who were matched on total IQ score but showed large discrepancies on subscores for language and non-language abilities. The researchers found that the group scoring high in language ability was significantly superior in all areas of achievement to the non-language group. The study also revealed that teachers were more likely to recognize brightness in this language-ability group. The authors suggest that schools do not offer sufficient opportunity for demonstrating achievement in skills related to non-language IQ.

Another study (Sanders, Mefferd, Jr., and Bown, 1960) distinguishes groups according to verbal-quantitative score patterns on an ability measure. The authors hypothesized differences in personality factors between groups which would be reflected in differences in achievement. A group scoring high on both parts of the ability test was compared with groups scoring high on one part and low on the other, both groups being matched on their total score. A unique feature of this study is that it includes data derived from a complete urinalysis of all subjects.

The high verbal high quantitative group (VQ) achieved higher grades in all subjects. This group showed moderate need strength for both autonomy and affiliation, plus a strong desire to become leaders as determined by personality measures. Physiological data showed a tendency toward passive emotional display, indicative of maturity, less activity than the low verbal high quantitative group (vQ), but much more activity than the high verbal low quantitative group (Vq).

The Vq group did best in verbal subjects, but not so well as the VQ group. Personality tests characterized the Vq group as idealistic, subjective, imaginative, and intuitive. Also the tests show the Vq group as having high aspirations but low need for perseverance, rejecting authority and conformity, and seeking attention. Urinalysis of this group showed more aggressive emotional temper, less maturity, and indicated that the Vq group was least active of all groups.

The vQ group received their best grades in quantitative courses, but did better in verbal courses than the Vq group did in quantitative. Showing a strong need for authority and direction, they were also introspective, objective, and systematic. Urinalysis showed them to be the most active, and the physiological indicator of maturity placed them slightly lower than the VQ's but much higher than the Vq's.

The considerable success of the physiological instrument in distinguishing intellectual and personality groups suggests its potential use in many other applications. These studies also demonstrate that ability and achievement are not simply independent measures but, indeed, are complex processes to which a variety of factors are related.

The next section suggests the complex problems involved when intelligence tests are used as measures of ability to identify over- and under-achievers. McDonald (1964) examined the relationship between an intelligence test and a reading test. The author found that group intelligence tests as a whole are inadequate measures for disabled readers, since a high correlation between the intelligence tests and reading tests indicates that they are measuring the same thing. McDonald suggests the use of the Wechsler Adult Intelligence Scale, analyzed by sub-test, as a solution to discovering the real abilities of such students. Students who are inadequately prepared with skills to demonstrate their actual performance potential may be expected to cause problems for persons attempting to identify over- and under-achievers.

The fourth and final example of a measurement problem associated with identifying over- and under-achievers deals with the relation of the non-intellective factors and achievement. McQuary and Truax (1955) were concerned with developing a non-intellective scale for use in selecting over- and under-achievers. The scale consisted of a selected set of twenty-four Minnesota Multiphasic Personality Inventory (MMPI) items, chosen for their presumed power to discriminate over- and under-achiever groups. The authors found that their scale did discriminate among a group composed of over- and under-achievers with reasonable accuracy, 77.2 per cent in the under-achiever group and 90.9 per cent in the over-achiever group, when the middle range of scores, 7-14, was excluded. However, subjects falling in this middle range of scores, 57 per cent of the group, were selected for over- and under-achievement at no better than a chance level. Therefore, this scale seems to be of limited practical value when taken by itself. But non-intellective factors remain a significant consideration in measurement designed to identify over- and under-achievers.

Summary

The nature of the relationship between ability and achievement is an important matter in identifying over- and under-achievers. This relationship is not as direct and uncomplicated as it is often assumed to be. The following statements summarize the findings discussed in the first section of this chapter.

1. There are several important problems in identifying groups of under-achievers.
    a. Researchers often do not report sample selection procedures (Farquhar and Payne, 1964).
    b. Given the same data, different statistical procedures select different groups of over- and under-achievers (Farquhar and Payne, 1964).
    c. Different criterion measures (e.g., grade point average on achievement tests) select different groups of over- and under-achievers (Pippert and Archer, 1963).
2. Measurement problems affecting discrimination of under-achiever groups are statistical measurement error, regression effect, and heterogeneity of criterion measure (GPA from different colleges, fields of study, etc.) (Thorndike, 1963).
3. Intellectual ability is not a homogeneous factor; different ability patterns yield differences in achievement, total ability being held constant (Gunderson and Feldt, 1960; Sanders, Mefferd, Jr., and Bown, 1960; and McDonald, 1964).

Predicting Achievement

The discussion in this section is devoted to summarizing studies which attempt to predict achievement. Prediction is simply a specialized kind of measurement in which the researcher uses the results of one or more measures to predict the results of another measure. The relationship between these measures is typically reported in a statistical probability statement called a correlation coefficient ($\underline{r}$). The statistical probability statement is called a multiple correlation coefficient ($\underline{R}$) when two or more variables are used to predict another independent variable.

Prediction of success in college is a matter of great concern to educators who are responsible for making decisions about admitting students, enrolling students in particular courses, and evaluating the performance of graduates. The empiric literature reviewed in this section is centered on studies designed to predict academic achievement of students in college by using as predictors: aptitude measures, high school records and grades, personality, and attitude measures.

Aptitude as a Predictor

Several types of aptitude predictors and measures related to aptitude predictors are discussed first. Richard Boyce (1963) presents a historical summary of academic prediction at the college level. This article deals with a first attempt at prediction, a complete failure, conducted at Columbia University around 1900; relates the great breakthrough in prediction with the Army Alpha Test ($r = .49$) in 1920; describes the hopeful Thirties when psychologists thought that perfect prediction would soon be possible; reveals the disillusionment of psychologists in the following years; and reports some very real success in prediction in recent years. Boyce presents a table summarizing the methods and median results of no less than 445 studies. The author indicates that recently researchers have been able to get correlation coefficients as high as .75 when high school grades were used as a predictor. Entrance examinations weighted on achievement have also been successful in recent years.

A study by Juola (1960) examined the usefulness of aptitude measures in predicting achievement in college. This ambitious study compares the predictive validity of five aptitude measures administered to entering freshmen at one university. Three of these, the College Qualification Test (CQT), the School and College Ability Test (SCAT), and the ACE (1952), were administered to a single sample of subjects. A fourth, the Ohio State Psychological Examination (OSPE), was given the same year but to a different sample. The fifth test, the Scholastic Ability Test (SAT) was given to still another independent sample during the previous year. Predictions were made on five grade point average (GPA) criteria, over-all GPA, basic course GPA, non-basic course GPA, communication skills GPA, and natural science GPA. The author states that "The basic-non-basic dichotomy is provided to compare the merits of the tests in predicting a criterion which is common to all students, on the one hand, and one which reflects the large diversity of curricular patterns on the other."

It was found that four of the five aptitude measures predicted better for females than for males. Prediction values were lower for all aptitude measures on non-basic GPA than for any of the other four criteria. The correlation for basic course GPA's went as high as .72 with the CQT for males and .75 with the SCAT for females. The evidence suggests that these two tests might be the most effective aptitude predictors of college GPA for each sex. Both predicted significantly better than the ACE for both sexes. Both the SAT and OSPE seem to predict total GPA somewhat better than the other three aptitude tests for males, and at about the same level as the other tests for females.

Discrepancy measures have also been used to predict college grades. Froelich and Mayo (1963) indicate that over- and under-achievement discrepancy scores, in addition to their use to identify criterion groups, may also be used successfully as predictors. The authors report that such scores combined with ability measures yield prediction correlations ranging from .49 to .67.

Isard and Lasky (1961) have devised a predictive technique especially useful for students being counseled during probation. It uses a discrepancy score between an ability measure (OSPE) and a score on the Draw a Man Test (DAM). The DAM in this application was used to measure the amount of perceptual motor differentiation. Subjects showing a standard score discrepancy of 1.3 or greater were predicted as non-achievers. Using a GPA achiever-non-achiever cut-off point of 2.00, the test was found to be successful (p less than .02).

It is an interesting phenomenon of prediction, however, that ability measures do not predict significantly better than chance for those students re-admitted after being dropped for academic failure. This finding is reported by Arthur A. Dole (1963) in an article specifically dealing with this subject, and several references (Merrill, 1954; Page, 1960; Warman, 1956) support this contention. Dole also notes that individual interviews with guidance counselors have been similarly unsuccessful, but reports some success in development of a battery of measures which may, when perfected, yield improved results.

In general, however, aptitude measures are reasonably effective predictors of academic performance in college for the general college population which is assumed to be normally distributed. Whether specialized groups meet the assumptions of normality may be questionable, however. It may be that the difficulty in predicting the behavior of deviate groups rests in assuming normality where it does not exist. Perhaps one should raise the issue of the need for refined statistical measures to deal with radical dispersion apparent within deviate groups, before progress can be made on prediction of college success and other behavior for deviate groups.

High School Record and Grades as a Predictor

Because it has been demonstrated that individual achievement patterns have a general tendency to persist throughout the educational career and because high school records are usually available, considerable research has been directed at using high school grades to predict academic success in college. Four studies dealing with high school grades as predictors are included in the discussion which follows.

Holland and Nichols (1964) have conducted an extensive study designed to predict academic success in college for students of high academic ability, finalists in the National Merit Scholarship program. The predictors employed in the study were student self-reports of their grade-related achievements and activities in high school. This study is especially interesting because little variation would be expected to occur due to the fact that the subjects were limited to students with a very high level of ability.

It was found that "achievement in high school or daily activities, interests or involvements which are related to achievement," were the best predictors of academic success in college. These findings indicate the axiom in educational research that past performance predicts future performance.

McCormick and Asher (1964) report on a study in which high school GPA's, along with a number of other variables for the graduating class of one high school, were used to obtain a correlation coefficient of .69. The predictors used were high school GPA, GPA's in math, foreign language, and social studies, the Otis Ability Test, and the verbal section of the SAT. The SCAT was rejected as virtually useless for this population. These authors suggest that predicting from one high school for several colleges may be a better approach than predicting from many high schools for a single college, as is usually done. The researchers urge that each high school determine the combination of predictors which is best suited to its special student body. The American College Testing Program is currently doing research in this problem area.

In a third study dealing with high school grades as a predictor, Scannell (1960) corroborates a point made by McCormick and Asher noting that the prediction computed from a sample for one college will serve as well for another quite different college. McCormick and Asher urged that predictions be made from a single high school. Both studies indicate that predictions made from one high school sample will generalize from college to college. Scannell found high school GPA to be the best single predictor of college GPA. High school rank, which is sometimes used almost interchangeably with high school GPA, suffers from distortion in small graduating classes. He suggests that GPA is undoubtedly the more stable measure of the two, and his data bear this out. A unique finding in the Scannell study was that eighth grade achievement test scores (ITBS) yielded a higher correlation (.85) with college GPA than did (ITED) scores for the twelfth grade. This correlation involved a correction for the relatively narrow range of scores compared to norms for these tests. If this finding should hold up in more thorough investigation, it would show some interesting comparisons with the British testing system, which selects the students who will be permitted to pursue an academic education at approximately eighth grade level.

The findings reported in these four studies indicate that high school grades are excellent predictors of college grades. For that matter, high school grade records have generally been found to be the best single predictor of college grades (Boyce, 1963).

Personality and Attitude Measures as Predictors

Personality is another construct which researchers have attempted to relate to achievement. Two studies are reported in which the MMPI was used. A third study reported in this section is closely related to traditional personality variables and is concerned with measuring a student's tendency to falsify socially desirable responses on a test.

Anderson (1964) and Hackett (1960) used selected groups of MMPI items in predictor scales. The Hackett scale yielded a correlation with college GPA of .61. The multiple correlation value including ACE scores was .69. The correlation of college grades with ACE alone was only .39. It would seem that a better aptitude measure might significantly improve Hackett's results. The Anderson scale, designed to measure academic aspiration, yielded a correlation coefficient of .54 with GPA and a multiple correlation value of .70. When Anderson's scales were combined with the CQT (College Qualification Test), the CQT correlated with GPA at .54. The Anderson scale consisted of 49 items and the Hackett scale of 72 items. It would be useful to know what overlap, if indeed any, exists between these two scales. Hackett's sample was composed of all male subjects, while Anderson's was composed of both sexes. Anderson's scale predicted college GPA much better for females than for males.

Still another predictive technique utilizes a rather ingenious scale designed to measure facade. Facade is defined as the tendency to fake test responses in order to present a desirable impression. The authors, Brown and Abeles (1960), hypothesized that low achievers would have a greater tendency to resort to facade than would high achievers. Indeed, scores on the two facade scales showed significant negative correlation with subsequent college GPA. The scales themselves require subjects to indicate which words they know from a vocabulary list containing fake words and then to select the proper definition of the real words on the list. Scores were the number of fake words identified plus the number of real words identified but not acutally known. The scales were highly correlated with each other and showed low correlation with vocabulary knowledge.

Personality measures as predictors of academic success in college appear to be more effective in combination (multiple *R*) with other predictors such as aptitude tests. Only moderate to moderately high correlations are reported between independent personality measures and college GPA. The research dealing with attempts to control the testing situation may be the area where personality variables can make the greatest contribution to predicting academic success.

Several researchers have devised various types of attitude scales for use as predictors. Two such attitude studies are reported. The first study examined attitude measures along with other measures. John French (1963) reports the utility of a number of very short aptitude, interest, and personality measures designed to predict success in specific major fields. The tests were constructed to insure low correlations from test to test. French found the personality tests to be the least useful of those tests administered. The aptitude measures predicted absolute levels of achievement best, but the interest measures were best in differential prediction, i.e., predicting relative achievement levels in closely related fields.

The second study dealt only with attitude measures as predictors of success in college and was exploratory in nature. Juola (1963) has written a progress report on his attempt to develop a school-oriented attitude scale designed to discriminate between high and low achievers. Although the scale is still in an early stage of development and has been used as only a discriminator, it is designed for eventual use as a predictor. Juola has classified his subjects by sex and curriculum, and, although his scale discriminates between high and low achievers for the group as a whole, differences do exist. This finding suggests the possible use of separate scales.

Attitude measures generally have not been found to have the predictive value that aptitude measures have. Attitude measures seem to predict in some studies as well as, or better than, personality measures. Because attitude and personality measures are still embryonic in the level of sophistication of measurement and because there are problems in relating attitude measures to actual behavior, it may be some time before attitude measures prove to be useful predictors for determining success in college.

Summary

As a final note in the subject of prediction, Watley (1964) suggests a method for determining the efficiency of any given set of academic predictors. This process, which involves testing the number of successful students at each GPA level for a sample other than the one from which the prediction is made, serves two important functions. First, an optimum cut-off point may be chosen to maximize the number of correct predictions for successful and unsuccessful groups. Second, although the addition of a certain predictor does significantly increase the coefficient of correlation overall, the inclusion of that variable may not increase, and may even reduce, the level of prediction for a given GPA.

Prediction of academic success is a matter of greatest importance to university administrators concerned with college admissions. Educational literature contains literally hundreds of studies of the type reported in this section. Obviously, the studies included in this section do not begin to comprise a complete listing of research which has been done in this area. Rather, these studies have been selected for their recent origin and representative qualities. An excellent review of the literature on prediction of academic success in college is presented by Fishman and Pasanella (1960).

It should be remembered that the levels of prediction reported in this section are all from published studies. One might suspect that the less successful endeavors have not been reported in the journals. Boyce (1963) reports isolated instances of prediction at levels as high as .75. However, the author's summary table shows no median level above .61 (for a three-variable $\underline{R}$) with the median correlation coefficient level falling between .43 and .58 for most predictors. Perhaps enthusiasm on the subject should be tempered by these facts.

A summary of the findings reported in articles in this section are listed below.

1. College entrance examinations and/or ability tests are valuable predictors of success in college (Juola, 1960; McCormick and Asher, 1964).
    a. Different tests are more effective for different universities.
    b. Different tests are more effective for different high school samples.
    c. Some tests predict better for males than females or vice versa.
    d. Sub-scores from the different areas sometimes make better predictors than total scores for achievement or for students with limited educational backgrounds.

2. High school GPA is the most effective single predictor (Boyce, 1963; McCormick and Asher, 1964).
    a. High school GPA is a better predictor for students from large high schools than students from small high schools.
    b. Selected high school course grades often improve prediction.

3. High school rank is a good predictor but biased in favor of small schools (Boyce, 1963).

4. Several non-intellective predictor scales, usually based on attitudes toward school, are being developed and have proved only moderately successful in predicting college GPA (Anderson, 1964; Hackett, 1960; Brown and Abeles, 1960; French, 1963; Juola, 1963).

5. Under-achievement or discrepancy scores make good predictors (Froelich and Mayo, 1963).

6. The best predictors are multiple regression models constructed from a combination of the best predictors available (McCormick and Asher, 1964; Watley, 1964).
    a. Increased measurement error may make addition of too many variables inadvisable.
    b. The most effective regression models are determined for each special sample.

7. The best predictors available do not exceed r = .75 (Boyce, 1963).

Factors Related to Achievement and Under-Achievement

The studies reported in this part of the chapter are concerned with various factors related to achievement and under-achievement. Thorndike (1963) asserts that, aside from the problems of measurement and selection of criterion groups in studying over- and under-achievement, there remains the very important task of identifying and measuring other phenomena, including mainly the non-intellective variables associated with achievement. In this instance non-intellective simply means all variables other than intellectual ability or previous academic achievement. This is an arbitrary definition for a complicated word found very frequently in educational research literature. The problem of determining what is and what is not a non-intellective factor is by no means a simple one. This definition is not presumed to be the solution; rather it merely suits the particular needs of this chapter. A fuller discussion of the term is offered by Fishman in The American College (Sanford, ed., 1962). It is necessary to examine these non-intellective factors in order to define realistically the over- and under-achiever groups to be studied. It is Thorndike's belief that these variables are basically immodifiable and not subject to experimental manipulation. Furthermore, the author asserts the effect of these non-intellective factors must be accurately gauged and applied in specific situations so that "true" groups of over- and under-achievers may be chosen and residual variance may be limited to those factors which can be effectively dealt with by experimental treatment.

The first portion of this section describes research on the general non-intellective factors related to achievement. Next is a discussion of creativity and achievement; then motivation and achievement are examined. The fourth part reports findings on personality and achievement, and the fifth deals with anxiety and achievement. Data on adjustment and achievement appear next, followed by a report on demographic data and achievement. The eighth part of this section is devoted to a consideration of family background, parental attitudes, and achievement, while the last part of this section deals with socio-economic status and achievement.

General Factors and Achievement

Educational literature abounds with studies directed toward the discovery of non-intellective variables and the assessment of their effect on achievement. This part of the section presents non-intellective research findings which did not seem to fit logically into the categories discussed later in the chapter. The variables considered briefly are persistence of under-achievement, sex differences, teacher discrimination, achievement tests and grades, health, self-estimates, study habits, vocational preferences, attitudes, work habits, reading skills, and classroom and non-classroom activities.

Persistence of Under-Achievement. Perhaps the most significant finding in all the literature, and one which holds up from study to study without exception, is that under-achievement is a persisting phenomenon. Many studies (Carter and McGinnis, 1952; Diener, 1960; Dowd, 1950; Frankel, 1960; Knaak, 1957; McQuary, 1953; Pearlman, 1952; Schmelzlee, 1964; and Shaw and Brown, 1957) show that students who are under-achievers at the college level have also been under-achievers in high school and even earlier. Since this finding is so widely reported and suffers no disagreement, it is perhaps justified to consider it as conclusive for the present.

Clinical psychologists also have noted the self-perpetuating nature of under-achievement, and have attributed it to neurotic personality structure, possibly a rejection of the family. It has been called a need to fail (Kirk, 1952) or "non-achievement syndrome" (Roth and Meyersburg, 1963).

Sex Differences. The matter of sex seems to play a role in under-achievement. In a study specifically dealing with the beginning of academic under-achievement, Shaw and McCuen (1957) have found that males who are under-achievers in their last years of high school show lower performance than the achiever group beginning in the first grade. This difference becomes significant (p = .01) in the third grade and continues at that level throughout the public school career. The picture for females is somewhat different, however. The female group of eventual under-achievers actually performed better than the achiever group for the first five grades. But performance falls below the achiever group in grade six, becomes significant (p = .01) at grade nine, and like the male group, stays at this level.

Very consistent in the literature is another finding, that females achieve at a higher level than males. Carter and McGinnis (1952), Dowd (1952), and Lambert (1963) report this information directly, but a great many other writers treat this occurrence as common knowledge, and make it a basic assumption of their own work without even referencing it. Sex operates consistently on general level of achievement. It is also clear that there are far fewer female under-achievers than males. In addition to the above studies, Pippert and Archer noted that there were fewer females than males for the group of under-achievers selected by grades. It is interesting to note that just the opposite was true of the group of under-achievers selected by an achievement test.

Teacher Discrimination. There is considerable evidence to support the assertion that teachers discriminate against under-achievers, particularly boys. Phillip Lambert (1963) has found that teachers have a stereotype of the "successful" and "unsuccessful" child; the stereotypes are based largely on agreeable or disagreeable classroom behavior. In the Lambert study, teachers chose 42 girls and 28 boys as "successful" and 29 girls and 41 boys as "unsuccessful." A study by McNeil (1964) states what many of the aforementioned articles in this section perhaps imply, that boys actually suffer discrimination from their teachers during their early school years when they are rated below the level of their actual achievement because of behaviors peculiar to their sex. McNeil offered identical learning opportunities for all subjects and found that boys in the experimental group showed no inferiority in learning to read with programmed instruction; but in an ordinary classroom, the same boys were inferior after a similar learning situation. Data were presented that indicated that these boys did not receive classroom treatment equal to that of the girls in the group.

Achievement Tests and Grades. Another very consistent finding in the literature is that whenever achievement test data are available along with grades, that group found to be significantly lower than the norm in grades, with ability partialled out, shows no significant difference on the achievement tests (Knaak, 1957; Malpass, 1953; Pippert and Archer, 1963; and Shaw and Brown, 1957). Furthermore, Malpass (1953) points out that while a measure of students' perceptions of and attitudes toward school is significantly ($p = .01$) correlated with grades, no relationship exists between these measures and achievement test scores.

Taken together, these findings suggest the hypothesis that a significant group of so-called under-achievers are boys whose grades have suffered by their teachers' discrimination against them; as measured by an achievement test, the real achievement of these under-achievers is actually at a level commensurate with their abilities. These data also imply that grades, rather than being in any way a pure measure of achievement, are actually contaminated to great extent by teachers' extraneous judgments of superficial (or at least non-academic) aspects of the student's personality. This would account for the remarkable ability of grades to predict more grades, regardless of important changes in the age, curriculum, environment, and maturity of the student. Shaw and Brown (1957), having noticed the similarities which obtain between under-achievers and normal achievers state, "What appears to be 'under-achievement' is not actually the case. Rather, the individual is learning, but his high school teachers and college instructors do not sense or measure this achievement."

Health. The matter of state of health has not seemed to be a significant variable affecting achievement. Frankel (1960) and Pearlman (1952) did not find any differences in the general state of health between normal and under-achievers. Frankel, however, reports that under-achievers are absent from school for health reasons significantly more frequently.

Self-Estimates. The matter of students' self-estimates has been considered by researchers concerned with under-achievement. Orville Brim, Jr. (1954) has found that self-estimates of intelligence are positively associated with achievement. This relationship falls just short of significance, however, when actual IQ is partialled out (i.e., equalized for all subjects). Berger (1963) reports rather different results when he notes that willingness to accept limitations, such as, making mistakes and not always being among the best, is positively associated with achievement. Berger's W.A.L. scale predicts achievement successfully for all but the lowest aptitude group of males, but for only the highest group of females. Middleton and Guthrie (1959) and Kimball (1953) confirm Berger's hypothesis.

Study Habits. Several researchers have looked for an association between under-achievement and study habits or amount of time spent studying. Gerberich (1941), Diener (1960), and Dowd (1952) found significant differences on both these variables between over- and under-achievers. Mabel Lum (1960) reports no significant differences in a study-habits and attitudes scale between under-achievers and a normal group, but highly significant differences between over-achievers and both normal and under-achievers. Lum's research shows that while over-achievers formed a *discrete* group on the study-habits variable, under-achievers did not. This last finding by Lum points up the necessity for including a normal group in under-achievement research. If data on normal achievers had not been included in this study, the data would have indicated that a low score on this study-habits scale discriminates the under-achiever group. Such is not the case. Yet, many studies of under-achievers do not make comparisons with a normal group.

Vocational Preference. This section deals with relationships between a student's vocational choice and his achievement. Several patterns which are not necessarily conflicting were reported in occupational interests as measured by the *Kuder Vocational Preferences Test*. Two studies which included subjects of both sexes reported no significant differences in the vocational interests of females. Diener (1960), however, found that male under-achievers scored higher on the artistic scale, and Pearlman (1952) found that under-achievers scored higher on the manual and persuasive scales. Diener was making comparisons with an over-achiever group and Pearlman with high ability achievers. Frankel (1960), in a study of males only, found that under-achievers scored higher in mechanical and artistic interests and achievers higher in scientific and computational.

Morgan (1952) found that achievers showed significantly greater interest in social service occupations, while under-achievers leaned strongly toward business and sales contact on the Strong Vocational Interest Blank.

Carter and McGinnis (1952) and Knaak (1957) both report that a specific vocational choice is positively associated with achievement. Frankel (1960) found that significantly more achievers planned to enter general fields of science than under-achievers who more frequently planned to enter applied science and technical fields. Pippert and Archer (1963), however, report no significant differences between achievers and under-achievers in the Kuder test or in vocational choice. Generally, under-achievers show greater vocational interest in applied science, sales, and business contact fields, and achievers show greater interest in research science fields.

Attitudes. It has been assumed in much educational research that attitudes play a significant role in achievement. Several researchers have investigated attitudes to ascertain what relationship exists between student attitudes and achievement. Gerberich (1941) states that over-achievers, more than under-achievers, like school and tend to feel that they get a "square deal" in their classes. Also, Dowd (1952) indicates that under-achievers are likely to dislike their courses and their professors. Malpass (1953) found that conforming attitudes toward school are significantly related with grades. Knaak (1957), however, found no significant differences between high and low achievers in attitudes toward school and school subjects.

In this same area, Frankel (1960) has found that achievers find math easiest and like math and science best, while they like English least and find it hardest. Under-achievers, on the other hand, name science as the easiest and best liked, foreign language as least liked, and both foreign language and mathematics as hardest. Dowd (1952) found that under-achievers' interests were more frequently inconsistent with the curricula pursued. The effect of this difference was most serious for students in a technological curriculum. Armstrong (1955) corroborates this finding. Armstrong (1955); Brown, Abeles, and Iscoe (1954); Hopkins, Molleson and Sarnoff (1958); and Mitchell (1959) found that under-achievers are more likely to be in a field chosen for them by others.

In summary, it seems that one group of under-achievers may consist of students who are greatly interested in science but who lack the mathematical ability or skills to achieve well in it. This group tends to seek out the more technically oriented fields of science to pursue in school and in their vocations.

Contrary to Dowd's and Armstrong's findings, Morgan reports that more achievers than under-achievers chose goals which were not congruent with their measured interests. Morgan's sample may be anomalous in this respect since Dowd's finding seems more likely to be true.

Employment. Limited findings are reported concerning the relationship between number of hours spent working and achievement. The relationship of course load to achievement has also been investigated. The number of hours spent working was found to have a negative effect on achievement by Carter and McGinnis and Diener; Dowd, however, found no significant difference on this variable. Both McQuary and Shaw and Brown found that high achievers tend to carry a larger than normal course load. Therefore, the effects of hours of working on achievement are not clear.

Reading Skills. Research on the effect of reading skill on achievement reported here reveals conflicting findings. McQuary (1954) has found that speed of reading shows a high positive association with academic achievement. Shaw and Brown (1957), however, report that reading ability does not discriminate under-achievers from a general achievement group. Carter and McGinnis (1952) indicate that outside reading has a positive effect on achievement, but Gerberich (1941) reports the opposite effect. McQuary (1953) has isolated an "introverted reader" factor which includes those students who do a large amount of non-required reading and is not correlated with achievement. These findings suggest that effectiveness in reading is related to achievement, but that the specific conditions of this relationship are not clear.

Classroom and Non-Classroom Activities. The association between extra-curricular activities and under-achievement is indefinite. Dowd (1952) reports no significant difference on this factor. Pearlman (1952) has found achievers to be more well-rounded in their extra-curricular activities. Gerberich (1941) and Frankel (1960) attribute a negative effect to participation in fraternities, social activities, and intra-mural sports. Diener (1960) also found fraternity membership to be a negative factor in achievement. McQuary (1953), however, reports a highly significant positive correlation between participation in high school extra-curricular activities and college achievement, but only for the urban student. In summary, the effect of extra-curricular activities on achievement is not clear.

The last study reported in this section is concerned with in-class and out-of-class achievement. Edwin A. Locke (1963) conducted a revealing study differentiating factors associated with in-class, as opposed to out-of-class, achievement among high ability students. Locke has found that classroom achievement is significantly related to vocabulary, self-control, and socio-economic status, while out-of-class achievement is related to creative energy, independence, and originality. Creative energy and independence are actually significantly negatively correlated with classroom achievement for girls.

Summary. All these findings reflect only a very general overview of research pertaining to factors associated with achievement. The findings point in many directions and suggest the following general non-intellective factors which seem related to achievement:

1. Under-achievers have a strong tendency to continue to under-achieve (Carter and McGinnis, 1952; Diener, 1960; Dowd, 1950; Frankel, 1960; Knaak, 1957; McQuary, 1953; Pearlman, 1952; Schmelzlee, 1964; Shaw and Brown, 1957).
2. Under-achievement usually begins very early in grade school for boys, somewhat later for girls (Shaw and McCuen, 1957; Carter and McGinnis, 1952; Dowd, 1952; Lambert, 1963).
3. Females, on the whole, achieve better than males.
4. Teachers have a tendency to discriminate against boys in the early grades (Lambert, 1963; McNeil, 1964).
5. Teachers have a tendency to prefer the conforming student (Lambert, 1963).
6. Under-achievers by ~~grades~~ GPA do not differ from the norm on achievement tests (Knaak, 1957; Malpass, 1953; Pippert and Archer, 1963; Shaw and Brown, 1957).
7. Achievers have more positive attitudes toward school than under-achievers (Gerberich, 1941; Dowd, 1952; Malpass, 1953).

8. Study habits may be positively associated with achievement (Diener, 1960; Dowd, 1952; Gerberich, 1941; Lum, 1960).

9. Under-achievers show greater vocational interest in applied science, sales, and business contact fields; achievers show greater interest in research science fields (Diener, 1960; Frankel, 1960).

10. Under-achievers are found in academic programs inconsistent with their interests more frequently than achievers (Dowd, 1952; Armstrong, 1955).

11. Reading ability may have a positive effect on achievement (McQuary, 1954).

12. Extra-curricular activities, course load, hours spent working and health have little or no effect on achievement (Carter and McGinnis, 1952; Diener, 1960; Dowd, 1950; McQuary, 1953; Shaw and Brown, 1957; Pearlman, 1952; Frankel, 1960).

13. Fraternity membership has a negative effect on achievement (Diener, 1960; Frankel, 1960; Gerberich, 1941).

Creativity and Achievement

This section of the chapter is concerned with the major trends of thought and recent experimental research exploring the nature of creativity, particularly as it applies to learning in educational settings. Research has proceeded on the assumption that prevailing teaching methods do much to stifle natural creativity in children by opposing it with an enforced, docile, directed method of learning. Creativity researchers also assume that this stifling will cause the highly creative person to have problems which may impair his academic performance.

Eisner (1963) has written a review and discussion of problems in creativity. The author considers attempts to discover the nature of human creativity, to measure creativity, to formulate general concepts, to discover how the creative nature interacts with other aspects of human personality, and to determine what possible effects might accrue to the stubbornly creative person in an essentially directed learning environment.

It is this last aspect which was of most concern to the staff of the Experimental Freshman Year Program. There is a widespread suspicion that a considerable group of so-called "under-achievers," or even low-achievers, may be persons who are creative individualists and who find little recognition or reward in the peer-oriented, conforming school systems. It is hypothesized that such individuals might "bloom," when given the proper environmental conditions and begin to produce at the advanced level of which they are presumed capable.

Getzels and Jackson, leading researchers in the field, have found (1962) that teachers prefer to have the highly intelligent students in their classes rather than the highly creative. Torrance suggests that creative students may suffer from pressures to conform which could possibly induce psychopathological behavior patterns probably inhibiting performance.

One of Getzels and Jackson's major findings is that creativity is not correlated with intelligence. If this is true, an entirely new and unexplored factor in the problem of performance prediction is introduced. Creative abilities may be expected to be correlated with achievement just as abilities measured on standardized ability tests are. If creative abilities are truly independent of what is commonly measured as intelligence, then it would seem that a whole area of achievement, that derived from creative effort, has not been effectively predicted. Such unpredicted aspects of achievement as creativity have not been perceived generally in the ordinary school situation. Those students who exceed performance levels predicted from measured abilities, i.e., the over-achievers, do not appear as highly creative individuals, but rather seem to have derived their superior performance from other rather compulsive personality variables (Mitchell, 1959). Thus, if it is true that creativity is not correlated with intelligence, then it is also true that the achievement which one would expect of highly creative individuals is indeed being stifled. Clearly, it is crucial to determine the truth of Getzels and Jackson's assertion.

Some researchers do not support the contention by Getzels and Jackson that creativity is not correlated with intelligence. Banghart and Spraker (1963) suggest that it is more probable that a significant positive correlation does exist. The authors cite the fact that various intelligence measures are not perfectly correlated. Results depend on the specific skills being tested. Trabue (1962) suggests that creative children may be bored by intelligence tests and do less well than their "true" ability would indicate. Then too, measures of creativity are still quite crude. All these factors would tend to depress artificially the measured level of correlation between creativity and IQ. Banghart and Spraker found a significant correlation of .59 between creativity and intelligence in the study reported here. Getzels and Jackson's finding cannot be rejected on the basis of the empirical evidence of a single study; however, neither can it be accepted completely, in view of Banghart and Spraker's and Trabue's very reasonable explanations as to why significant correlations have not been derived.

Torrance (1963) hypothesizes that two distinct types of learning exist, creative learning and learning by authority. Creative learning is defined by Torrance as "natural," that is, fulfilling naturally a whole complex of strong human needs. Burkhart (1962) shares his view. Creative learning would use what Guilford (1950) calls "divergent thinking," while learning by authority would use "convergent thinking." These concepts have been widely accepted in distinguishing the creative person from the non-creative person. There is little doubt that American education depends heavily on convergent thinking. For example, a typical history examination would ask, "How was the South divided after the Civil War?" rather than "Would the South have been treated differently if Lincoln had not been assassinated? How?"

One can readily see how an ideal answer to the second question would include everything of value in the answer to the first, plus a great deal more information. However, the freedom from authority in the second question also allows for a great deal of extraneous and worthless meandering. Torrance himself states that learning by authority has been used for its efficiency. Although such learning does exclude divergent thinking to a great extent, this in itself is not evidence that the creative personality is being stifled. Torrance's assertion that some individuals have a strong preference for creative learning and "do not respond favorbly to present educational progress" is not supported by any hard empirical evidence.

Torrance's second point is perhaps of greater significance. He states that a peculiar anomaly of democratic society is that teachers stress the democratic process so heavily that they even attempt to determine truth by voting. He cites an example of a class which decided to determine the sex of baby rabbits by voting. In cases where the "authority" in learning by authority is nothing but group consensus, it is very likely that any individualist would become alienated.

Pippert (1963), a co-author of the Pippert and Archer study mentioned earlier, offers some ambiguous experimental support for the contention that suppression of creative talent can be seen in lowered achievement. He found that under-achievers as determined by GPA were significantly more highly creative than under-achievers as determined by achievement tests. In fact, in one part of the test the former group even significantly exceeded the normal achiever group.

One interpretation of this study is that the creative group of under-achievers suffers in terms of GPA while the less creative group does not. This would seem to indicate the tendency for teachers to discriminate against the creative student. But by another interpretation, the study merely shows that this under-achiever group is no less creative than the group of normal achievers. Clearly there must be some other reason for their under-achievement. The evidence suggests that creativity is at most a marginal determining factor of achievement, and no clear causality has been established.

Finally, an extensive study of the effects of creativity in teachers (Yamamoto, 1963) also yielded ambiguous results. The highly creative teachers showed a stronger theoretical orientation than did the less creative teachers, but there was no significant difference in their observed classroom behavior. There was also no significant increase in achievement for highly creative students taught by highly creative teachers. However, there was a significant main effect with teacher creativity in social adjustment and total personal adjustment. Yamamoto suggests that highly creative teachers may have difficulty in articulating their potential in the classrooms.

Summary. In all, there is nothing to suggest a clear mandate in radically revising teaching techniques or educational philosophy. All writers stress the need for further research. A summary of the findings in the field of creativity reported in this section follows:

1. The correlation between creativity and intelligence is probably not as low as was originally proposed. (Banghart and Spraker, 1963; Trabue, 1962).
2. Teachers prefer highly intelligent to highly creative students (Getzels and Jackson, 1962).
3. High creativity may be a marginal factor contributing to under-achievement (Pippert, 1963; Getzels and Jackson, 1962; Torrance, 1963).
4. There is little evidence that highly creative students perform better in situations where creativity is stressed (Banghart and Spraker, 1963; Yamamoto, 1963).

Motivation and Achievement

It is a commonly shared idea that academic achievement on the college level is largely a function of motivational needs in the personality of the student. Few doubt that such needs exist, but researchers have encountered an uncommon amount of difficulty in arriving at satisfactory measuring instruments with which to gauge motivation. This difficulty is demonstrated by the fact that many of the more recent journal articles begin with a lengthy discussion of the confusion and the lack of consistency found in previous research on the subject.

Two instruments have been widely used to measure motivation. One is a projective technique using analysis of picture stories. This technique was developed by D. C. McClelland, who is a leading researcher in the motivation field and senior author of The Achievement Motive (1953). The other instrument is the Edwards Personal Preference Schedule, a multi-factor paper and pencil test. This review includes several articles evaluating or comparing these two instruments plus a discussion of several other methods which have also been used.

Weiss, Wertheimer, and Groesbeck (1959) conducted a study to determine whether any relationship exists between the McClelland and Edwards scales. Previous research (Bendig, 1957; Birney, 1957) had failed to find any association. Weiss, et. al., also attempted to determine to what extent each of these measures is associated with grades. The authors administered both measures to an all-male sample and found a significant positive correlation between the two instruments of .26. It was also determined that both the Edwards and the McClelland measures were significantly correlated with GPA, the McClelland test at the level .34 and the EPPS at .42. Multiple correlation coefficients including an aptitude measure were highly significant, .63 and .64 respectively; the three measures, McClelland, EPPS, and an aptitude measure, taken together yielded a multiple correlation coefficient of .68. The authors concluded that the two instruments do measure the same thing, at least to some extent, and that both are very valuable tools for predicting motivation. It was suggested that the lack of success of previous investigations was caused by the nature of the samples, the samples being one in which the sex of the subjects was not controlled.

A study by Heilbrun (1963) further points up the possibility that the motivation variable may operate very differently for men and women. Heilbrun did a detailed analysis of the Edwards scale. The purpose was "to investigate whether two-scale configural scoring of the EPPS would clarify the role of personality factors in college achievement." Results in this direction were negative with one notable exception, but, nevertheless, some interesting findings were reported. The only two-scale pattern found was for female low achievers; a high score on autonomy was paired with low scores on deference, intraception or thinking in terms of the motives underlying behavior, and abasement. Other findings were as follows. High achieving males scored high on need for achievement and low on need for change. Male non-achievers scored high on nurturance. Female high achievers, on the other hand, scored high on exhibition, autonomy, and aggression, and low on intraception, abasement, and endurance. It is striking to note that the patterns for males and females are quite different, and, in the case of one factor (nurturance), completely opposite. It is not surprising, then, that mixed sex motivation studies show ambiguous results. Heilbrun notes that the patterns for males lean toward academically oriented factors while those for females reflect factors relevant to the nature of their social interaction.

An older study (Parrish and Rethlingshafer, 1954) investigated the McClelland test to determine whether it would discriminate groups of achievers and non-achievers. Both males and females were used in the samples. The researchers carefully matched their samples on eight relevant variables, varying only GPA. The fact that the sex was not controlled in the study may be one possible explanation why neither of two scoring methods yielded positive results.

Uhlinger and Stephens (1960) conducted an exceedingly complex study utilizing the EPPS, the Goal Preference Inventory, and the Incomplete Sentences Blank. Discrepancies between students' statements of their expected GPA and the predicted maximum possible GPA were also considered as independent variables measuring achievement motivation. Only the crude discrepancy measures discriminated groups of high and low achievers. The sample of students was matched for high ability and for several other variables. After testing the validity of the scores and finding it low, the authors concluded that none of the instruments satisfactorily gauges achievement motivation. The predictive validity of the tests in terms of academic achievement was seriously in doubt. However, this sample too included both males and females. The results might have been more stable had a single sex sample been tested.

Uhlinger and Stephens suggest the potential importance of a variable which they call "Minimal Goal." Minimal Goal, in their terms, "equals the amount of reward (the level of grades) which constitutes a positively reinforcing state of affairs for the organism." Several measures of expectancy were derived from the data in this study. According to the authors, "Expectancy pertains to the probability of obtaining the Minimal Goal." It was found that the expectancy scores discriminated high and low groups, although one did not reach statistical significance, and predicted achievement better than any of the motivation scores. The authors then suggest that "Minimal Goal" may be of greater importance in academic achievement than strength of achievement need.

One study (Lowell, 1952) has attempted to demonstrate the effectiveness of the McClelland measure in discriminating performance in a laboratory situation. Two tasks designed to demonstrate learning and speed of performance respectively were performed by the male subjects. It was found that subjects scoring high on need for achievement showed significantly greater improvement on the learning task ($p = .01$) and a significantly higher level of performance on the speed task ($p = .02$).

Michael, Jones, and Trembly (1959) presented the factor-analyzed results of data collected from still another measure of achievement motivation, the USC Inventory of Study Methods and Attitudes, a Likert-type attitude scale. Seven factors were clearly identified for both men and women; in addition there were three others for men and two for women. Of the seven factors identified for both sexes, it was found that the factor, freedom from neurotic behavior patterns, was most predictive of success. The factors, self-reliance and positive effect, showed loadings of the criterion variable for women. The authors concluded that measuring achievement motivation was an exceedingly complex task on which further research should be conducted.

One group of authors, Brown, Abeles, and Iscoe (1960), has sought to gauge motivation through actual behaviors rather than through paper and pencil tests and then to discriminate groups of high and low achievers on the basis of these behaviors. In the three separate studies reported in this article, motivation has been operationally defined as students' participation in optional activities. The first study emphasized the importance of each individual's participation in completing a research study; the second was somewhat coercive and emphasized the glory of the school; and the third was a classroom study in which participation was of direct academic benefit to the students involved. All three successfully and significantly distinguished high and low achiever groups.

Finally, Donald Thistlethwaite (1959) has presented the effects of external manipulation of motivation upon groups of high potential students matched on critical variables. Subjects were finalists in the National Merit Scholarship Program. It was determined that those students who won Certificates of Merit received more social recognition in newspapers and school assemblies, than did those who received only letters of commendation. Thistlethwaite hypothesized that this social recognition would increase the motivation of the Certificate of Merit winners to pursue careers in scientific research or college teaching and to continue their education to higher levels. It was also proposed that these students would show more favorable attitudes toward intellectualism. Results of a questionnaire supported these hypotheses. The author suggested that the findings probably err in a conservative direction since both groups received some recognition and that the effects of social recognition would probably be much greater with more disparate groups. Since the motivational states of the subjects prior to the treatment were not determined, it is difficult to accept the credibility of the findings. The group did seem well matched, and so it is perhaps not unreasonable to suppose that the original difference between Certificate of Merit and letter of commendation winners may have been at least partially ascribable to differences in motivation.

The findings derived from this sampling of research seem to indicate that motivation is a highly significant variable in determining academic achievement, that there is an important sex difference in motivational patterns, and that much more research needs to be done in the field before motivation may be used successfully as a predictor.

Closely related to the concept of motivation is that of level of aspiration. Whereas motivation may be thought of as a personality variable, which is relatively stable over a period of time and in various circumstances, level of aspiration is more specific to the situation at hand. An interesting study by Kausler (1959) shows that this too may be an important variable associated with achievement.

In Kausler's study subjects were asked simply to state the level of performance they expected to reach on a simple arithmetic task. Members of a second experimental group were told a minimum acceptable level of performance before they established their level of aspiration. The two experimental groups did not differ significantly in their performance. Performance of the experimental groups was significantly (p = .01) higher than performance of the control group who did not state a level of aspiration prior to the task. The author gives a theoretical explanation of the phenomenon as follows:

> The results of the present study support the hypothesis that expressing a level of aspiration increases motivation, and suggest that these motivational properties are a function, at least in part, of S's frame of reference. In the free situation where LOA is the only independent variable, the overt expression of an aspiration level apparently evades a simple set which increases overall drive level of S's and influences performance of the subsequent task. . . . The resulting increment in performance level, however, appears to be unrelated to the magnitude of the expressed LOA.

If such a simple manipulation does indeed have a significant effect, it would be very interesting to see how well this effect holds up in more complex and perhaps longer-term task situations.

Summary. A summary of the more important findings on motivation and level of aspiration follows.

1. Motivation is probably the single most important non-intellective variable accounting for residual variance in achievement (Weiss, Wertheimer, and Groesbeck, 1959; Heilbrun, 1963; Lowell, 1952; Brown, Abeles, and Iscoe, 1960).

2. There are important differences in the motivational patterns of males and females (Weiss, Wertheimer, and Groesbeck, 1959; Heilbrun, 1963).

3. These sex differences are great enough to have obscured the findings of any motivational research which does not control for sex (Weiss, Wertheimer, and Groesbeck, 1959; Heilbrun, 1963).

4. The Edwards Personal Preference Inventory is probably the most efficient and reasonably valid scale extant for measuring motivation (Weiss, Wertheimer, and Groesbeck, 1963).

5. External manipulation of level of aspiration or task-specific motivation may be effective in raising levels of achievement (Kausler, 1959).

Personality and Achievement

Human personality encompasses a wide range of variables, some of which are important enough to have been considered separately in other sections of this chapter. In this section personality means the general frame of reference from which the individual reacts to his environment. Included are such factors as emotional and educational maturity, self-concept, and introversion-extraversion. Some of the findings in this area seem well supported but warrant further research to substantiate them and to integrate them in a cohesive body of theory relevant to achievement. It must be said at the outset of this section that most measures, and perhaps even concepts, of personality are extremely crude. Therefore, rather conservative meaning should be attached to findings relating personality and a behavior such as achievement.

For example, it appears that under-achievers may be less mature than students who perform at their expected levels. Powell and Jourard (1963) report that while under-achievers are no less secure than the average scholar, their dependency patterns are quite different. The average college student finds his security in relationships with his peers, but the under-achiever still shows strong emotional ties to his parents. The authors interpret this as evidence of immaturity. Also, Morgan (1952) reports that on the Strong Vocational Interest Blank achievers scored significantly higher than non-achievers on the interest maturity scale. MMPI scores showed achievers significantly higher than non-achievers on Dominance, Social Responsibility, and Intellectual Efficiency scales. These factors also suggest greater maturity for achievers than non-achievers.

Another group of writers classifies over- and under-achievers into sub-groups by personality type in order to show how different personality syndromes may lead to the same result in terms of achievement. Mitchell (1959) categorizes his subjects on two scales, over-under-achievement and acceptance or rejection of self. The author found self-accepting under-achievers to show little anxiety or concern about their academic failure. They fulfill their ego need in other ways. But self-rejecting under-achievers are very anxious and feel inadequate. However, they are optimistic and tend to overestimate their future achievement more than any other group. Self-accepting over-achievers are low-anxious, feel mature and well liked, and find great satisfaction from their work. But self-rejecting over-achievers are very anxious, high strung, and cautious, and driven in their academic work. More than any other group they tend to underestimate their future achievement.

Middleton and Guthrie (1959) present a factor analysis of a questionnaire which was intended to demonstrate the existence of many sub-groups representing personality syndromes of high and low achievers. The results are difficult to interpret because of the peculiar nature of the sample. The groups were divided on the basis of college grades into high and low achievers. Both groups had done equally well in high school, but the high group as measured by college grades had scored significantly higher on a college aptitude test. Several of these factors are suggestive of the personality types reported by Mitchell.

Cartwright (1963) notes comparable differences in types of under-achievers. In counseling work, the author became aware that certain under-achievers who were troubled at their failure came to seek help, while others did not. The researcher found that as long as students were well adjusted socially on campus, they did not tend to seek help even though they were doing poorly academically. But those who had considered themselves to be hard working and successful in high school and were finding it difficult to maintain that self-image, did seek help. Frankel and Dowd found that under-achievers could not be discriminated by any greater frequency of personal problems. Frankel reports that "problems with school" was the only area checked significantly more frequently by under-achievers than achievers.

Shaw, Edson, and Bell (1960) hypothesized that achievement and under-achievement might be reflected in students' self-concept, as revealed on an adjective checklist. The authors found that male achievers checked stable, realistic, optimistic, enthusiastic, reliable, clear thinking, and intelligent, significantly more often, while male under-achievers checked immodest, reckless, relaxed, mischievous, argumentative, and restless. The authors interpret these findings to mean that male achievers feel more positive toward themselves than do under-achievers. Roth and Myersburg (1963) also found that under-achievers are self-depreciating.

The results suggest a stable, conforming personality for achievers as opposed to an impulsive, anti-authoritarian personality for under-achievers reported in other studies (Hopkins, Molleson, and Sarnoff, 1958; Horrall, 1957; Kimball, 1953; Kirk, 1952; Kurtz and Swenson, 1951; Shaw and Brown, 1957; Shaw and Grubb, 1958; Walsh, 1956). All these writers found under-achievers to be hostile to authority, though they attribute this hostility to varying sources.

The only adjectives checked more frequently by female achievers were ambitious and responsible. Indicating ambivalence in feeling about self and role, female under-achievers checked a long list of rather contradictory items. An indication of the great differences between males and females in personality factors related to achievement is that only one word was found on both the male and female lists.

Several patterns seem to be implied from the above findings, but differences in samples, instruments, and techniques make useful generalizations impossible. The way is clear for further experimentation specifically designed for the unification, clarification, and broadening of past research.

Richard Lynn (1960) has attempted to unify his research and ground it in a solid base of psychological theory. Combining the theories of an educational psychologist, Peel (1956), and a personality theorist, Eysenck (1957), Lynn has developed the hypothesis that extraverts learn more slowly than introverts. The author supports this hypothesis with several observations of well-known phenomena in education and seeks to demonstrate it in a laboratory situation.

Briefly, Eysenck's theory is that there are three dimensions of personality which are independent of intelligence. One of these is introversion-extraversion, which corresponds, according to Eysenck, to Hull's construct of reactive inhibition, "in that it is assumed that extraverts generate reactive inhibition quickly and dissipate it slowly." This reactive inhibition slows down the conditioning process. Therefore extraverts become conditioned more slowly than introverts. Lynn cites Francks (1957), who has directly confirmed this.

Peel's theory simply states that many simple educational tasks involve instrumental conditioning. Learning to read would be such a task. It follows then that those who learn these tasks quickly should be introverts and those who learn more slowly should be extraverts. Lynn's experiment supported the hypothesis at a low level of significance. Even more interesting than Lynn's moderate success is the fact that several other studies reported below reveal the same findings even though they may not be couched in the same theoretical reference and even though they use very different measuring instruments.

Also based on Eysenck's theory was a study conducted on college students by Savage (1962). The researcher found both neuroticism and extraversion to be negatively related to academic performance. He suggests the possibility of a curvilinear relationship of the neuroticism variable with performance.

Owens and Johnson (1949) found that the strongest characteristic of under-achievers was extraversion. The authors report a reference, Heston (1947), who, in the same vein, found over-achievers to be introverts. Duff and Siegel (1964) also found that over-achievers tend to be unsociable. Likewise, Blackham (1955) found that under-achievers are extraverted and over-achievers are introverted.

Beach (1960) made a study designed to discover which learning situations are best suited to students of differing personality types; his efforts revealed that less sociable students performed significantly better in instructor-centered situations (i.e., straight lecture sections and instructor-led discussion groups), while the more sociable students did significantly better in small discussion groups with no instructor contact.

In the group which was assigned to completely independent study there were no distinct differences by sociability. Since virtually all actual classes are of the instructor-centered type, this study can be construed as substantiating the introversion-extraversion theory of learning postulated by Lynn.

McKenzie (1964) abstracted a group of items from the MMPI which was administered to groups of over- and under-achievers as well as to normal achievers. The researcher's findings seem to lean in the direction of the above studies. McKenzie found that over- and under-achievers could be successfully discriminated from normal achievers, but not from each other. Both groups were found to be highly anxious. Further analysis revealed that under-achievers tend to externalize their conflict; they are more impulsive; they are antagonistic to authority; and they reject social values. On the other hand, over-achievers internalize their anxiety, become depressed, and suffer from feelings of inadequacy. Only one study seems to stand in contradiction to the introversion-extraversion hypothesis. Hall and Gaeddert (1960) found that their friendship-rating scale was significantly and positively related to GPA.

The study of personality remains fascinating and tantalizing to the psychologist. Even though the ramifications of personality are dramatically real and complex to the sensitive observer, paper and pencil indices, as well as intuitive diagnoses, are often disappointing. A satisfactory bahavioral-rating scale, objective and valid from observer to observer, is yet to be developed.

Pioneering work in this direction, proceeding from a Rogerian analysis of personality, has been undertaken by Tomlinson (1959) and Gendlin (1961) among others. Although their work has met with relatively little success in furthering the development of psychotherapy, as was hoped, progress still has been made in determining recognizable and objectively classifiable types of behavior which seem to operate in the same way for all individuals.

Observer validity is still a problem, probably because the field is so new; yet it seems that this is a step in the right direction. Certainly if such a scale could be developed and sophisticated, it would be far superior, on the individual level, to the complex and easily faked instruments such as the MMPI, which are now in common use. Such a behavioral evaluation was part of the subject selection procedure in the Experimental Freshman Year Program.

Summary. The findings on the relationship of personality to achievement seem to make clear that the typical under-achiever is an immature extravert who may have a low opinion of himself. It also seems likely that no one personality pattern typifies the entire group of over- or under-achievers, but that several distinct sub-groups exist. The summary of the findings in this section is as follows:

1. Under-achievers are more frequently extraverts and over-achievers are more frequently introverts (Lynn, 1960; Savage, 1962; Owens and Johnson, 1949; Heston, 1947; Duff and Siegel, 1964; Blackham, 1955; Beach, 1960; McKenzie, 1964).

2. Some evidence suggests that under-achievers may have a tendency toward neuroticism (Savage, 1962; Blackham, 1955).

3. Under-achievers are less mature than achievers (Powell and Jourard, 1963; Morgan, 1952).

4. Work is under way in developing a behavioral rating scale for measuring personality (Tomlinson, 1959; Gendlin, 1961).

Anxiety and Achievement

Educational researchers seem to assume that anxiety is probably a critical variable in academic achievement. Since this variable is "internal" and therefore not directly observable, research results depend both on the operational definition of the concept and on the type of scale or measure used. Reported here are several studies which examine the effects of anxiety along with other independent variables related to achievement: task importance, ability level, sex, and social class. There appears to be no general agreement in the findings reported here. However, the studies are not actually contradictory. The lack of agreement in the findings seems to be due either to the peculiarities of the samples or to the special ways the data have been treated in combination with other variables.

Malnig (1964) has found that there is considerably more variability in level of performance among high-anxious students. Anxiety scores were not predictive of achievement over the total population, but the correlation between ability and GPA was much higher for low-anxious students than for the total group (.664 over .334). The correlation for high-anxious students was non-significant .153.

The findings reported by Malnig take on added interest when it is noted that Wrightsman (1962) has found that high-anxious students performed less well on an intelligence test only when the importance of the test was stressed. This was not found to be true of highly motivated students, who performed at the same level whether the test was important or unimportant. The importance of the test did not have any effect on low-anxious students. If the importance of the test also affects GPA, this may account for some of the variability Malnig noted among high-anxious students.

Spielberger and Katzenmeyer (1959) have found that anxiety has a negative effect on achievement for only those students in the middle ability range. The authors hypothesize that low ability students cannot achieve well under any circumstances and that high ability students will achieve fairly well on the basis of their ability alone.

Phillips (1962) has studied the effects of sex, social class, and anxiety on academic achievement,and reports a number of significant findings. It was found that higher levels of anxiety were associated with lower achievement. Females showed higher anxiety scores than males, but the anxiety and achievement variables showed significant interaction with social class and with each other. Higher anxiety was associated with lower achievement for females, but with slightly higher achievement for males. Higher anxiety had a negative effect on the achievement of middle-class students, but no effect on lower-class students. Higher anxiety resulted in an increase in achievement for lower-class males and a decrease for lower-class females, while it resulted in a larger decrease in achievement for middle-class females than for middle-class males.

Phillips also found that mean teacher-grades were lower than mean intelligence for middle-class males, regardless of anxiety level. This was not true for middle-class females; also mean teacher-grades were lower than mean intelligence for low anxiety lower-class females. Finally, to substantiate what was reported in many other studies, there were no significant differences between standardized achievement and intelligence in any of the sub-samples.

While the findings in the above studies seem to fit together well and to show great promise for future research, Grooms and Endler (1960) show results which are directly contradictory to those obtained by Malnig. Grooms and Endler proceeded from Sarason and Mandler's (1952) theory that anxiety should have a negative effect on aptitude tests but a positive association with grades, the latter being due to the opportunity for practice and anxiety reduction in the classroom. Grooms and Endler have found that the negative effect does exist on aptitude tests but that anxiety has no total effect on GPA. These authors report the direct opposite of Malnig's findings; they say that anxiety scores show a significant positive effect on achievement among high-anxious students in which case these scores improve prediction from .30 to .63.

It is this sort of absolute contradiction in research which raises serious questions about experimental bias. Experimental bias is being recognized increasingly as a critical problem in the behavioral sciences. Each of these investigators has begun with a preconceived notion about the operation of anxiety and has proceeded to demonstrate the truth of his theory. One is left to speculate about what uncontrolled variables must have been operating to produce clear-cut, yet dissonant, findings among and within these studies.

Summary. A summary of the findings on the relationship of anxiety to achievement shows that anxiety probably affects achievement negatively to a significant degree in certain circumstances, but the effect is confounded by interaction with other variables, such as motivation, ability level, and social class, so that research results are not definitive (Malnig, 1964; Wrightsman, 1962; Spielberger and Katzenmeyer, 1959; Phillips, 1962; Grooms and Endler, 1960).

Adjustment and Achievement

Adjustment, as a term in educational research, suffers from being too general and poorly defined. Like motivation and anxiety, it is used to describe those variables about which little is known. Most studies reporting on adjustment show poor results, and the term itself has all but disappeared in recent years as it has been replaced by others which are more specifically related to the data available. This section reports a brief review of some of the studies dealing with the relationship of adjustment to achievement.

Blackham (1955) reports that over-achievers have better mental health than under-achievers and that the latter are generally impulsive and immature. This author found no significant differences in most areas of adjustment, including social life and family associations. Owens and Johnson (1949) found that under-achievers tend to be preoccupied with social adjustment. Although these authors noted a slight tendency toward neuroticism in under-achieving subjects, this finding was interpreted as an effect of under-achievement rather than a causal factor. Under-achievers were found to be well-adjusted in most areas in this study.

Griffiths (1945) reports no significant association between adjustment and achievement at any level, and in fact, notes certain instances in which there is a tendency toward the opposite of the expected effect. Opposite findings were reported by Berger and Sutker (1956), who found that poor adjustment has its greatest effect in the middle ability range, but even there the association was not notably strong. These authors suggest that their finding has as its greatest value the recognition of poorly adjusted students for the purpose of special counseling.

Hoyt and Norman (1954) report that poor adjustment is associated with both under- and over-achievement and suggest the development of special scales for differentiating the groups. Similarly, Horrall (1957) found that adjustment is poorest for brilliant under-achievers, and next-poorest for average over-achievers.

Frankel (1960) reports that under-achievers present many more discipline problems then do achievers. This too can be taken as evidence of poor adjustment.

Summary. In summary, some writers report that under-achievers are maladjusted, while others report no significant differences in the adjustment for under-achievers (Blackham, 1955; Frankel, 1960; Griffiths, 1945; Horrall, 1957; Hoyt and Norman, 1954).

1. The source of the contradiction is probably inadequate operational definition of the term.
2. Conflicting findings suggest that the effect of adjustment on achievement, if it indeed exists, is probably not severe.

Demographic Factors and Achievement

There has been considerable speculation that the kind of community or high school from which the entering freshman comes will significantly affect his academic performance in college. This is of particular importance at Southern Illinois University, where so many of the students come from small rural communities far from any urban center. It is feared that these rural students may suffer from an impoverished educational background and that both the overall quality of the university students and the standards of the university may be reduced. Actually, the data generally do not support this hypothesis. There is good evidence to suggest that the negative results may be the result of improper handling of the data.

Weitz and Wilkinson (1957) found that graduation from a military academy showed statistically significant negative effects on achievement. Finger and Schlesser (1963) report that private school students perform less well in college than public school students. The authors were able to ascribe virtually all the differences in achievement to differences in academic aptitude and motivation. These differences favored the non-private schools over the private schools.

Schutz (1960) reports on a factor analytic study including twenty social, cultural, and community variables. He was able to isolate five factors: urban-financial, intellectual climate, economic stability, academic achievement, and low socio-economic status. The achievement test scores were the only variables to load on the academic achievement factor. The achievement test scores did not show significant loadings on any other factor, none being above .16. The author concluded that satisfactory achievement is equally possible for students regardless of community background. Unfortunately, the study did not include GPA as a variable. There is good reason to suspect that the results may have been different if GPA had been included since it has been demonstrated repeatedly that grades operate very differently from achievement test scores (e.g., Pippert and Archer, p. 163).

Uhlinger and Stephens (1960) report that the size of the high school graduating class had no effect on achievement. Lathrop (1960) offers the same finding, but with an interesting qualification. Although high school size had no effect in Lathrop's study, high school course pattern had a very significant effect (p = .001) in favor of the more academically oriented curricula. It stands to reason, however, that high school size may be a significant factor in determining the type of course pattern available since larger high schools can offer more varied course patterns. For example, out of the 1,516 students in the study, Lathrop had only fifteen included who had graduated from a small high school in a mathematics and science curriculum. As an interesting aside, Lathrop found that high school grades, controlled for course pattern, showed a significant bias in favor of small schools. If this is a common effect, it should certainly be taken into account in prediction equations.

In a related study, Washburne (1959) found that degree of urbanism was significantly correlated with achievement in a southwestern college, but not in a larger, more urban northeastern college. Upon further investigation, however, the author noticed that the same strong relationship existed in the northeastern university for students from urban areas with a population level up to 500,000, after which the relationship fell to zero. On similar findings from these two widely differing samples Washburne concluded that urbanism is a significant factor, limited as indicated above.

Carter and McGinnis (1952) and Shaw and Brown (1957) show some evidence to indicate that an urban environment favors academic achievement, but Dowd (1952) found no significant difference in this factor.

The findings from Uhlinger and Stephens and Washburne suggest that other studies have failed to show any relationship between achievement and high school because the size of the school has been considered rather than the type of community in which the school was found.

Summary. A summary of the findings related to demographic factors follows:

1. Under-achievers are found with greater relative frequency in private schools and military academies than in public schools (Finger and Schlesser, 1963; Weitz and Wilkinson, 1957).

2. High school size does not affect achievement (Lathrop, 1960; Uhlinger and Stephens, 1960).
3. High school course pattern (academic versus non-academic) is very significantly related to achievement (Lathrop, 1960).
4. High school size significantly determines course pattern (Lathrop, 1960).
5. Urbanism is positively associated with achievement up to population 500,000. In larger cities the relationship disappears (Washburne, 1959).

Family and Parent Attitudes and Achievement

In view of the fact that family relationships play such an important part in the development of every individual, one could expect that the various aspects of family background might also have an important effect on the student's academic life. Therefore, this section of the chapter is devoted to examining the effect on achievement of such variables as the size and type of family, students' attitudes toward their families, and parents' attitudes toward their children.

Taken independently, strictly factual data on size of family, order of birth, type of religious affiliation, and education and occupation of parents, etc., have yielded conflicting, negative, or weak results in relationship to achievement. For example, Pearlman (1952) and Frankel (1960) found that size of family and order of birth had no effect on achievement, but Weitz and Wilkinson (1957) found that children without siblings performed at a lower level of achievement than children with siblings. Schoonover (1959) found that order of birth and length of interval between births made no significant differences in intelligence or achievement, but this author also found that siblings of either sex with brothers were significantly higher in both criteria than siblings with sisters. Neither Frankel nor Pearlman found differences attributable to incidence of divorce. Pearlman reports no significant difference in achievement by religious affiliation, but Myers (1952) found a difference in favor of Jewish students.

Pearlman likewise found no differences by parents' age and nativity or home language usage, but Myers found that achievers more frequently came from homes where at least one parent was foreign born. Frankel (1960) reports that fathers of achievers were more frequently engaged in professional, semi-professional, and managerial occupations and that significantly more working mothers were reported by under-achievers. But Pearlman found no differences by parental occupations.

A mother's failure to graduate from high school was the only family factor of several even to approach significance in the Carter and McGinnis (1952) study. But Shaw and Brown (1957) report only the slightest, and not significant, tendency for parents of achievers to be more highly educated than parents of under-achievers. Pearlman found a significant association only with fathers' education beyond the bachelor's degree and mothers' education at least through high school. French (1959) found that education and occupation level of the father had no effect on achievement. None of these factors shows a strong enough pattern to be considered highly significant.

A study by Weigand (1957) provides a clue which might explain the reason why family background variables prove insignificant. His hypothesis is that a major difference between achievers and under-achievers is the superior adaptive behavior of the former. For example, he cites the fact that although both groups come from essentially the same backgrounds, in terms of the variables mentioned above, major differences exist in the ways in which achievers and under-achievers interpret their own situations. The achievers show a much more favorable attitude regarding their environment. Under-achievers do not seem to be willing to exert themselves to improve their conditions in any way. Achievers consistently report that their home environment is "congenial and satisfying" while under-achievers repórt problems and adversity at home. But no real differences seem to exist among these variables.

This finding is corroborated by Frankel (1960) and Dowd (1952), who found no differences in the number of personal problems reported by achievers and under-achievers, and Owens and Johnson (1949) and Blackham (1955), who found that under-achievers are well adjusted in most areas, including family life.

Weigand found differences in the kind, though not the amount, of disciplinary control exerted by parents over the two groups. According to the students' reports, parents of under-achievers tended to be either autocratic or exceedingly permissive, while parents of achievers exercised discriminatory restriction, made allowances for special occasions, and inspired a willingness or desire for cooperation in their children without coercion.

Herriot (1963) states that the influence of social support from significant others, including close family members, is very important in determining students' level of aspiration not only in the decision about whether they will go to college, but also in the length of time they will stay. It was found that this was reflected in students' valuing direct advice from these significant others. It was also found that level of aspiration is a direct function of students' self-appraisal in regard to others.

These observations are suspect because the data are derived from open-ended interviews and may not be valid, but if the observations are true, one wonders whether the standardized tests reported in previous and following studies may be failing to make such fine distinctions as are described in Weigand's article. The failure to measure fine distinctions in human behavior may be producing the confusion which exists when the results of conflicting findings are examined.

The attitudes of parents toward their children have been examined in a more systematic manner than have been the attitudes of children toward parents but the results are less rewarding. Using a standardized scale in a study of parent attitudes, Drews and Teahan (1957) report that mothers of high achievers score significantly higher on the Dominating and Ignoring Scales. On the Dominating Scale, the difference was significant only for mothers of high ability students. The "I" Scale is interpreted to mean an authoritarian attitude toward children, while the "D" Scale indicates a punitive quality as well.

Teahan (1963), in a later study, administered the same scale to students as well as parents, and reports findings different from those obtained in the earlier study with Drews. Subjects were college students rather than high school students. In the second study the conflict between low-achieving females and their mothers and males and their fathers was emphasized. Since the parents are shown as being more dominating than the children, it is suggested that these students have not learned independence because of their conforming role in high school.

It is interesting that Teahan reports parents of high achievers significantly lower on both the "I" and "D" Scales than parents of low achievers. These findings are opposite from the result reported previously. Fathers of low achievers were found to be high on the Possessive ("P") Scale whereas no significant difference was found in the earlier study.

Shaw and Dutton (1962) used a different scale to measure the attitudes of parents of high school students. These authors found that parents of under-achievers had significantly more negative attitudes, with particular emphasis on suppression of sexuality, toward their children than parents of achievers. Results were considered separately for mothers and fathers of boys and girls. Another significant finding was that parents of under-achievers indicated less satisfaction with their roles as parents.

Although family environment and parental attitudes must certainly be important to the total personality of the cilld and to his academic achievement and although certain patterns may be emergent, it is evident that much work, both in theoretical and empirical problems, must be done in the field before any reliable statements can be made. These studies fail to take into account the rapidly changing cultural situation; so findings of dubious value at the time they were reported may be of even less value today. The limitations of the findings reported in this section suggest improved research methods and instruments must be created before really effective research can be done in the area of attitudes and achievement.

Summary. A summary of the findings related to students' family background and achievement follows:

1. Family size, parental education and occupation, sibling patterns, and family problems have little or no effect on under-achievement (Carter and McGinnis, 1952; Dowd, 1952; Frankel, 1960; French, 1959; Myers, 1952; Schoonover, 1959; Shaw and Brown, 1957; Weigand, 1957).

2. Under-achievers have more negative attitudes toward their families and family problems than do achievers (Weigand, 1957).

3. Reports on the effects of parent attitudes on under-achievers are conflicting, but sketchy patterns suggest that parents of achievers give positive direction and selective discipline to their children while parents of under-achievers are either very permissive or very autocratic (Weigand, 1957).

Socio-Economic Status and Achievement

This part of the chapter deals with an examination of the relationship of socio-economic status to achievement. Generally, when socio-economic status has been analyzed independently to determine the extent to which it is related to achievement, the relationship between the two variables has not proved significant. Under certain specific conditions for specific groups, however, there may be a relationship between achievement and socio-economic status.

Curry (1962), for example, has found that socio-economic status has its greatest negative effect on students at the low ability level. He notes little or no effect on achievement in arithmetic at any level. This is in keeping with the theory that arithmetic ability and achievement are relatively culture-free as compared with verbal operations, and it suggests that perhaps all studies of this nature should make this culture-free distinction.

Knief and Stroud (1959), using a standardized achievement test and a rating scale to measure social class, found a significant positive correlation between the two measures. Multiple correlation coefficients with various ability measures were as high as .853. This is particularly surprising since, in view of other findings on grading biases, it might be expected that correlations would be even higher with grades.

Washburne (1959) found no relationship between socio-economic status and achievement, either independently or in interaction with the degree of urbanism. The author suggests that any effect of socio-economic status might have accrued in the process of selecting which students will go to college. This could explain why the two studies reported above concerned with pre-college students show a significant effect, while those concerned with college students do not.

Brockington and Stein (1963) report that the proportion of students in the university from high social classes is much greater than expected and the proportion from low classes much smaller. This is in keeping with Washburne's suggestion. It was also found that while there is no significant difference by social class at the highest level of achievement, there is a significant difference in favor of the lower classes at the middle and lower levels of achievement. This study was conducted in Great Britain.

Only one recent study specifically concerned with cultural differences has been found. This was Rupiper's (1960) extensive research effort on the performance of Indian and white children in Kansas. It was found that achievement test scores from grades 4-12, all the grades included in the study, show a consistent significant difference in favor of the white children. No such bias in intelligence by non-verbal tests has been reported. This would seem to be a fruitful area for further research, particularly if a more modern, less racially or tribally biased concept of culture can be defined.

Summary. A summary of the findings relating socio-economic status to achievement follows:

1. Socio-economic factors have little or no general effect on achievement, but may interact with other variables to produce an effect in specific instances (Brockington and Stein, 1963; Curry, 1962; Knief and Stroud, 1959; Washburne, 1959).

2. Socio-economic status may have an effect in selecting which students will go on to college (Brockington and Stein, 1963; Washburne, 1959).
3. Systematically deprived cultural groups show lower scores on achievement tests than the general population (Rupiper, 1963).

Experimental Efforts to Improve Achievement

The articles examined thus far are representative, but not exhaustive, of the recent empirical literature dealing with achievement at the college level. Due to the limited space available, it has not been possible to consider at length these articles which have been published in the last decade. Also necessarily omitted from the discussion are some special problems such as research design, statistical manipulations and processes of formulating hypotheses. The research literature dealing with experimental treatments to improve achievement is omitted from the studies previously reported in order that the findings can be considered here as a major section. It is assumed that the reviews which have preceded this section have provided necessary data to clarify the assumptions and experimental treatments examined here.

The previous articles represent the first steps in that stage of underachievement research which Thorndike (1963) has recommended, the identification and measurement of non-intellective variables associated with academic achievement. These variables, Thorndike assumes, account for all but a small fraction of the variance remaining in the prediction values of achievement in college from ability measures, after measurement error has been eliminated. According to Thorndike these variables are essentially fixed and unchangeable in the personality, but understanding of them is necessary to determine who is a "real" under-achiever. The studies reported in the foregoing sections of this chapter are primarily concerned with the identification and measurement of the non-intellective variables discussed by Thorndike. After some of the non-intellective variables have already been identified and measured, it is logical for the researcher to proceed to investigate various treatments which may be applied in learning situations in order to improve conditions for achievement by those capable. It is these treatments with which this section is concerned. Included are studies dealing with remedial teaching, curriculum, ability grouping, counseling, interviewing, and controlled methods of classroom manipulation.

Remedial Teaching and Achievement

One group of studies represents attempts to improve reading capacity. The studies here are not concerned with accrued benefits in general achievement, but they are based on the assumption that reading disability is a serious handicap in academic achievement. Correlations with reading test scores generally bear this out.

Englander (1960) used a forced-choice questionnaire on attitudes toward reading. The researcher administered the questionnaire both before and after a remedial reading course and found a significant change toward more favorable attitudes toward reading and toward the self as a reader. Presumably this favorable attitude will reinforce successful reading behavior in a course and lead to further improvement in reading skills.

Schneyer (1963) made a discriminatory appraisal of the effects of a remedial reading course by examining results in the context of certain ability scores. This author found that those who had the lowest scores on the SAT began at the lowest reading level and improved the most. Schneyer concluded that this result came about because the SAT is biased against poor readers and that this group actually had greater ability than was indicated by the test. The researcher reasoned that the test results reflected the rapid reading improvement of the students.

One remedial teaching program, Lovell, Byrne, and Richardson (1963), involved young school children rather than college students. The program was an extensive one including student participation in full-time remedial clinics. Initial results were quite successful in terms of an improvement in general achievement, but the follow-up study showed that all gains were eventually lost after a period of approximately a year and a half. This study shows the great value of a follow-up evaluation of any long-term treatment.

Curriculum and Achievement

One study, Fahey and Ball (1960), examines the effect of a special freshman core curriculum on subsequent achievement through graduation. The curriculum consisted of basic courses in four basic areas; written and spoken English, humanities, social science, and natural science. The emphasis in all four areas was inter-disciplinary, similar in many ways though less elaborate than the General Studies program at Southern Illinois University. Criteria from both achievement tests and grades showed that students enrolled in the core curriculum achieved in all areas at least as well as and sometimes significantly better than students in the regular curriculum. Furthermore, significantly more students in the core curriculum eventually graduated ($p = .01$). In view of the great relevance to Southern Illinois University programs, it would be interesting to see further research in this field.

Ability Grouping and Achievement

Another group of studies deals with the effects of grouping students according to their measured levels of ability. The hypothetical basis for this treatment is the assumption that students will tend to reinforce the desired behavior of other students in the group. If the general level of performance is high in a high ability class as it should be according to most of the results of prediction, then the laggards will tend to be drawn upward to the general level of the group. In a heterogeneous group, the under-achiever will not be under such pressure because all levels of performance will be represented.

Using varying degrees of ability grouping, Abramson (1959) conducted a study in which students from several high schools were compared on the basis of their subsequent academic performance in college. No significant differences were found for any group. No effect was found in any course area. No differences in the number of honors awarded were found. No significant interaction with sex or ability level was found for any group. It was concluded that ability grouping in high school, either in special schools or special classes, makes no contribution to future success in college.

However, Karnes, McCoy, Zehrback, Wallersheim, and Clarizio (1963) met with considerably more success in their findings. Studying the effects of homogeneous ability grouping on a sample of high ability under-achievers in grade school, they found that the experimental group made significantly greater gains in achievement, creativity, and perceived parental attitudes than did a control group of high ability under-achievers in a heterogeneous ability class. The theory to which the authors attribute this finding is the one described earlier, that students will adjust their performance to match the general level of the group. This idea could explain the difference between the significant findings in this study of under-achievement and the no-significant-difference findings in the previous study of achievement in general. It appears that a homogeneous grouping may benefit under-achievers while there is no measurable effect on a larger ability grouping taken as a whole.

A third study, Passow and Goldberg (1958), approached ability grouping in a different way. In this experiment high ability under-achievers were grouped by themselves. No normal-achieving high ability students were part of the group. In the one class which these students had together, performance of the high ability under-achiever group actually fell below previous levels. This negative effect fits the previously stated theory by Karnes and his associates (1963); it again supports the idea that students' performance in any group will have a tendency to regress toward the mean of the group. Apparently these students reinforced each others' non-achieving behavior. By contrast, these same students were also isolated in a special homeroom in which they received informal guidance, personal counseling, and help in learning and study techniques. This aspect of the program was extremely successful, and the students' achievement in all classes other than the one mentioned above, was at a significantly higher level than they had attained previously.

The authors were able to distinguish groups of improvers and non-improvers within the experimental group; they found that the improvers scored significantly higher in correctness of writing, while the non-improvers showed a greater discrepancy between self-estimate of ability and wished-for ability. They interpret this finding to mean that the non-improvers had no incentive to try to improve.

The findings on the whole tend to support the theory that grouping by ability is beneficial to improving the achievement of under-achievers in specific educational settings.

Counseling and Achievement

Clinical and counseling psychologists have hoped that they would be able to provide a partial answer to the under-achievement problem. And indeed, some counselors have been able to report great success in this direction, some with individual and some with group counseling of under-achievers. Broedel, Ohlsen, Proff, and Southard (1960) report on an experimental study in which group counseling was employed in an attempt to raise the performance level of gifted high school under-achievers. Unfortunately, this experiment failed to produce any immediate significant gains in academic achievement. In fact, two of the counseling groups actually dropped in GPA both during and after the counseling sessions, the drop persisting up to one and one-half years after treatment. However, group members did show significant improvement in acceptance of self and others and in their interpersonal relationships.

Eklund (1957), however, reports successful results from group counseling of under-achievers at the junior high school level. Subjects were matched on relevant variables; background, test scores, and achievement. The experimental group underwent a group counseling treatment for five and one-half months. The control group had no access to counseling. The experimental group showed greater improvement in achievement, social adjustment, and home adjustment than the control group.

Spielberger, Weitz, and Denny (1962) also report more successful results from group counseling. Their subjects were college students selected on the basis of high-anxiety scores. The hypothesis was that highly anxious students are potential under-achievers and that early counseling experiences, prior to failure, would facilitate achievement. Counseled and non-counseled groups were matched for ability and anxiety. It was found that counseled students did achieve at a higher level than non-counseled students ($p = .05$). Furthermore, it was found that the coefficient of correlation between attendance rate at counseling sessions and achievement level was .63, which is highly significant ($p = .01$).

Similar results are reported for individual counseling. Ivey (1962) also used college students as subjects. This author reports that those counseled students who remained in school improved significantly more than students who were not counseled. However, a great many counseled students, 39 per cent, withdrew from school. The author attributes this finding to the fact that many of the counseled subjects were in academic difficulty prior to counseling and may have been on the verge of dropping out before the treatment.

Another attempt by Shouksmith and Taylor (1964) also met with success. A group of intermediate school under-achievers was given a test battery followed by a period of intensive individual non-directive counseling. These students scored significantly higher on subsequent achievement tests than under-achievers who had only the test battery and no counseling or a third group which had no treatment. Grade point averages were not reported.

Apparently both individual and group counseling can be effective in raising achievement levels of under-achievers. Wright (1957) reviews a study utilizing both counseling methods in a controlled comparison. Subjects were college students. Results showed no significant differences in improvement between counseling types, but both individually and group counseled students improved more than non-counseled students. The author concludes that both methods are equally effective.

Interviewing and Achievement

Many researchers have considered the possibility that simply interviewing students outside the classroom may have a positive effect on course achievement. Research has been directed toward discovering whether this is true and, if so, what type of interview is most suitable in a given situation or with different types of students. Moore and Popham (1960) compared a group which had student-centered and content-centered interviews with a control group which was not interviewed. The authors found that those students who had student-centered interviews scored significantly higher on the *College Inventory of Academic Adjustment*, a scale designed to measure non-intellective factors associated with academic success. These students exceeded both the control group ($p = .05$) and the group who had content-centered interviews ($p = .01$). However, analysis of covariance controlling for previous GPA and *ACE* scores showed no significant difference in final course grade, although the non-significant difference was in favor of the student-centered group.

Sherriffs (1949) hypothesized that certain students would improve academic performance with non-course oriented personal interviews and that the interviewer could reliably predict who these students would be by observations made during the interview. The experimental group did not differ significantly from the rest of the class on the first midterm examination grades. Then the interviews were conducted. The experimental subjects improved more than the controls from the first midterm to the second midterm ($p = .02$), but the difference from the first midterm to the final grade was not significant. The experimenter was successful in differentiating students; and it was found that those rated high on certain variables, especially family tension, achievement need, and praise need benefited more from the interview than other subjects.

Hoehn and Saltz (1956) came upon a very interesting finding in their study on the effects of teacher-student interviews. These experimental subjects were rated prior to the interviews on anxiety and rigidity. No significant difference was found between those interviewed and those not interviewed, nor was there any difference by anxiety or rigidity ratings; however, in the critical region of passing and failing, significant differences were found favoring the group interviewed. Among anxious subjects the interviewed group had a drastically lower failure rate than the non-interviewed (43 per cent over 13 per cent). But among rigid subjects the failure rate was much higher for those who were interviewed (38 per cent over 17 per cent). The interview had much less effect on non-anxious and non-rigid subjects.

In order to investigate this phenomenon further, the same authors conducted a second study in which two types of interviews were used, a "gripe" interview in which the subject was urged to complain about anything in his total environment which did not please him and a "satisfactions" interview which concentrated on those aspects of life which were currently satisfying to the subject. Results in final grades were the same as in the first study; that is, there was no significant difference by subjects or treatments except according to ability level. But as before, differences in failure rates were very evident, with the "gripe" interview strongly benefiting the anxious students and the "satisfactions" interview benefiting the rigid students. Also, low-anxious students were somewhat hindered by "gripe" interviews while they were somewhat helped by "satisfactions" interviews. In neither experiment did the average student show any gains through interviews. An interesting fact is that the interviews in these experiments were conducted by regular teaching personnel who had no training in counseling or interviewing technique other than the very brief training sessions provided by the experimenters. This shows that the treatment is easily administered and that highly trained staff are not necessary to produce the desired effect.

One final study, Stamatakos and Shaffer (1959), reports on the effect of different kinds of special attention on high ability female students' grades. The experimental group attended special functions and received literature; the second group received only the literature; and the third group received three letters from the University administration welcoming them and acknowledging their special potential. Although the experimental group reacted very favorably to the program and expressed a desire to continue in it, they actually had the lowest grade point average of any of the four groups. Differences among groups in GPA, however, were not statistically significant.

Controlled Methods of Classroom Manipulation and Achievement

The greatest amount of research effort to improve levels of achievement has been concerned with various techniques of controlled classroom manipulation.

These range from an assortment of simple instructional variations to the highly complex technological developments in programmed instruction and numerous audio-visual techniques.

Variations in Instruction or Classroom Procedure. A very simple procedure described by Duel (1958) was shown to be quite effective in raising the performance level of an entire class. Periodically throughout the course students were asked to rate themselves on their competence in the course material. It was found that these students achieved at a significantly higher level than students in another class, the latter being students who were matched for ability but who did not make self-evaluations in competence.

Another study, Standlee and Popham (1960), also concerns the effect of evaluation during the course proper; the evaluation was by periodic quizzes this time rather than self-rating. The authors found that students who had quizzes which were graded by the teacher did better on the midterm examination ($p = .05$) but not on the final examination. The authors suggest that the effect of the treatment was dissipated as the novelty wore off.

Eisner and Rohde (1959) have found that students who took notes immediately following the class lecture did just as well, both in initial learning and retention, as students who took notes during the lecture in the conventional way. Two tests covering the same material but separated by three weeks were given. No interaction effect was found by high and low achieving students.

In a study designed to elicit a different type of achievement, Parnes and Meadow (1959) found that "brainstorming" instructions yielded significantly more good solutions to problems than did instructions which stressed avoidance of poor solutions. It was also found that students trained in a course in creative problem solving performed better on the task of inventing a variety of solutions to problems than students who were not so trained.

An article by Sessions and Carruth (1962) is interesting, not so much for its non-significant findings, but for the reason that in all the literature it is the only article having to do with the effect of the time of day which the class meets on achievement. This is a matter which inspires great speculation among both students and faculty and would seem to be a potentially relevant variable, particularly for night schools. In any case, the authors report no significant differences in achievement between morning and afternoon classes.

Methods of Study. Several variations in study technique have been explored as methods to increase academic performance. Blue (1958) has found that students who study together in groups do significantly better than students who study alone. He checked his finding by alternating conditions after each test period and finally by having both sections in the group-study condition. In each stage the group in the experimental condition was superior.

Three other studies consider study method according to the relationship with the instructor. Kersh (1958) proceeds from the premise that students achieve better when they study independently rather than when information is simply given to them in an authoritarian manner. The purpose of the study was to discover whether or not this superiority is attributable to the students' having a better grasp of meaning when they learn independently. Kersh found that, immediately after the learning task, there was no significant difference in the performance of his three groups: one given no help, one partially directed, and one given the rules to be learned. But four weeks later on a follow-up examination, he found that the no-help group did significantly better than the others. On the basis of the phenomenon and from the results of a questionnaire given at the time of the follow-up, it was concluded that the superiority of the independent discovery group can be attributed to higher motivation rather than to a better grasp of meaning.

Hovey, Gruber, and Terrell (1963) were interested in Kersh's findings and constructed a study of their own in order to pursue them further. They sought specificially to measure curiosity as a dependent variable and to see whether or not differential amounts of curiosity are generated by the various experimental treatments. Like Kersh, these researchers found no significant difference immediately after the learning situation, but neither did they find a significant difference in the ten-months' follow-up test, although there was a slight tendency in favor of the self-directed study (SDS) group in both cases. A small, but significant, difference in curiosity, as manifested in question-raising behavior, was found to be in favor of the SDS group. The study was replicated with the same findings. The difference in findings in this study and Kersh's may be attributable to the difference between the time which elapsed before the follow-up test.

Ray (1961) notes a lack of theoretical homogeneity in research in study techniques and has sought to clarify the situation. This author too studied the effects of independent study and direct instruction on achievement, but differentiated three types of achievement: initial learning, retention, and transfer of learning. Results were classified according to three levels of student ability, to discover if any interaction was affecting results. No differences in initial learning were found between the two methods. As for retention, the author found no differences after one week, but after six weeks there was a significant difference in favor of the pupil discovery method. In the area of ability to transfer learned material the same pattern was found after one- and six-week intervals. Ray found no interaction of teaching method with ability level, the same patterns persisting as reported at each level of student ability. Since investigators found no positive effects with self-directed study on initial learning in any of the studies reviewed, it would appear that the effect of self-directed study on course grades and general level of achievement would be negligible. Furthermore, if the effect on retention is shortlived, disappearing before ten months, as Hovey, et. al. have found, then this study method would not seem to be very profitable. It is possible, of course, that some other benefit, such as greater efficiency through reduced instructor contact or more positive attitudes toward school work, can be found.

Programmed Instruction. Various methods of programmed instruction, ranging from simple test scoring devices providing immediate reinforcement and feedback on material learned and mistakes made, to programmed texts, to a veritable constellation of "teaching machines," have become increasingly prevalent in education in recent years. Quantities of literature have been generated from this innovation in instruction, some very technically oriented and some merely discussing the philosophical or ethical implications of mechanized instruction.

Since certain phases of the Experimental Freshman Year Program made use of programmed instruction and since these techniques are likely to become even more important as educational tools in the future, this section is devoted to a review of the literature on programmed instruction with particular emphasis on the research findings which suggest results which may accrue to the performance of low achievers.

It has certainly been established, even to the satisfaction of the most vigorous opponents of programmed learning, that these techniques are effective in imparting information, at least the basic factual information necessary to students at all levels of education and in all academic fields. Results in terms of net achievement attributable to programmed instruction methods are at least equal to those results evoked through traditional lecture-discussion methods (Banghart, McLaulin, Wesson, and Pikaart, 1963; Benson and Kopstein, 1961; Calvin, 1960; Collins, 1962; Cronbach, 1962; Ferster and Sapon, 1958; Gotkin and Goldstein, 1962; Hatch, 1959; Hickley and Anwyll, 1961; Hough, 1962a; Hughes, 1961; Klaus and Lumsdaine, 1960; Lewis, 1961; Maier and Jacobs, 1964; Oakes, 1960; Porter, in Galanter, ed., 1959; Reed and Hayman, 1962; Smith and Quackenbush, 1960). Also, many researchers note highly significant reductions in time required to assimilate programmed materials as opposed to ordinary classroom time devoted to the same material (Ellis, 1962; Ferster and Sapon, 1958; Frye, 1962; Gotkin and Goldstein, 1962; Hough, 1962a; Hough, 1962b; Hughes, 1961; Porter, in Galanter, ed., 1959; Silberman, 1963; Smith, 1962; Wendt and Rust, 1962).

In either case, use of programmed material frees teacher time for use in other more complex or advanced types of instruction. This is particularly important for remedial courses at the college level, where use of highly trained faculty for teaching material which should have been learned previous to entering college is certainly wasteful of a very valuable resource, particularly at a time when universities are laboring under unprecedented pressure of burgeoning enrollments. If programmed instructional devices can salvage valuable student talent without handicapping university facilities, a dual purpose will have been served. In this sense programming techniques may prove very valuable in the education of underachievers.

The theory of programmed instruction hypothesizes that each student will assimilate information in small bits of increasing difficulty, proceeding to more complicated items only after he has learned the previous material (Lumsdaine and Glaser, 1960). Hypothetically then, given enough time, every student should be able to learn all the material in a given course; thus, a problem now faced by instructors would be eliminated, this problem being the difficulty of teaching advanced material depending on material supposedly learned in an earlier course, when, in fact, some students may have learned only 60 per cent of that material and still attained passing grades. These teachers frequently have to reteach material before proceeding to the prescribed material of the course. Through programmed instruction, necessary redundancy in learning should be tailored to the needs of the individual, as he necessarily goes back over unlearned material in order to complete the program. This aspect of programmed instruction should alleviate the necessity of holding back a whole class for the sake of the slow learners, while preventing these slower students from falling so far behind that they are unable to learn new material because of their deficiencies.

Unfortunately, research to date indicates that programmed instruction does not overcome individual differences in learning (Gotkin and Goldstein, 1962; Hough and Revsin, 1963; Hughes, 1961; Keislar, 1959; Lambert, Miller, and Wiley, 1962; Maier and Jacobs, 1964; Reed, 1962; Roe, Case, and Roe, 1961; Silberman, 1963). From one study specific to the application of programmed material to over- and under-achievers Silberman (1963) reports the familiar finding that over- and under-achievers continue to over- and under-achieve. A high school teacher, Marmor (1963), reports considerable success using a programmed English text with very slow learners, but only in combination with a great deal of individual attention. This author does not describe the success of the slow learners in relation to the achievement of the class as a whole. Reed and Hayman (1962) found that a low ability group did better with the teacher than with programmed instruction. Research findings in general suggest that techniques of programmed instruction have not yet come to grips with the specific variables which bring about low achievement or under-achievement.

At present the bulk of research in programmed instruction is concerned with controversy over the relative merits of such technical problems as teaching machines versus programmed texts, linear versus branching programs, constructed versus multiple choice responses, or immediate versus delayed reinforcement. Silberman (1962) points out that results on these issues as a rule yield no significant differences, although each specialization has its vigorous proponents or detractors. One interesting finding reported in several instances is that the quality of the program is probably much more significant than any of the technical variations (Cronbach, 1962; Della-Piana, 1962; Gotkin and Goldstein, 1962; McKee, 1962; Resnick, 1963). With one previously mentioned exception, Silberman (1963), relating any of these technical variables to the specific problem of under-achievement, is absent.

Audio-Visual Instructional Media. This section includes research findings showing the effects on achievement of presentation of filmed, televised, telephone, and tape recorded material, as opposed to traditional lecture form of classroom presentation. The theory of programmed instruction emphasizes the atomizing and organizing of material to be learned for maximum achievement. Any of the instructional media reported in this section might conceivably incorporate programming. But the emphasis in this section is on mode of communication. All the mass media discussed here share the same advantage, a substantial saving of instructor time, held by programmed instruction. As in the case of programmed instruction, most research is technically oriented and not specific to the aims of this chapter. Where this is the case, only general findings are reported.

The American Educational Research Association's (1962) review of the literature on educational films reports that films have usually been used as supplemental material rather than as a replacement for the regular lecture. Research results show that films enhance material by making it more attractive but do not add appreciably to achievement. Special effects such as color or animation likewise yield no significant differences in achievement.

Deutschmann, Barrow, Jr., and McMillan (1961, 1962) report on a series of experiments designed to test the hypothesis that elimination of irrelevant stimuli from the learning environment will increase efficiency of the learning procedure. The authors propose that the ordinary classroom presents a large number of irrelevant stimuli and that certain other media, tested in the experiments, reduce these stimuli to varying degrees and accordingly increase "channel efficiency," the ratio of relevant to irrelevant material learned.

The two subsidiary hypotheses, from which the main hypothesis was mathematically derived, were that subjects would learn the same amount of relevant material in each treatment and that they would learn more irrelevant material in the treatments predicted less efficient. The amount of relevant material learned, less the amount of irrelevant material learned, is the channel efficiency score.

The first experiment included only two treatments, regular classroom and a filmed presentation of the same material. The second experiment added two treatments, so that the treatments were, in proposed order of increasing channel efficiency, ordinary classroom, classroom plus film, film only, and televised reproduction of film. In each case the main hypothesis was confirmed, with channel efficiency increasing significantly in the predicted order of treatments. The subsidiary hypotheses were also confirmed.

Research results on the effects of televised instruction are more equivocal. Leese (1964), reviewing the field, cites the advantage of the far-reaching capabilities of educational television but notes the complete lack of feedback and interaction in televised presentation of material. Although no research specifically states it, this may be particularly disturbing for the low achiever. Several writers (Carpenter and Greenhill, 1955, 1958; Macomber and Siegel, 1957, 1960; Kasten and Seibert, 1959; Seibert, 1957; Throop, Assini, and Boguslavsky, 1958) report actual losses in amount learned by television instruction. All these writers found televised instruction to be inferior to the regular classroom except in very specialized cases, i.e., those times when very small objects were demonstrated to the class.

Some experiments, on the other hand, show that televised teaching yields at least equal results with other treatments. For example, Becker and Dallinger (1960) compared the effects on achievement of the same material taught by regular classroom lecture, televised lecture, and "bibliography" method, a combination of regular lecture reduced by one hour per week plus selected outside readings. No significant differences were reported among the treatments. The authors conclude that the bibliography method was most economical since it saved one lecture period per week, and, therefore, best; however, if the televised lectures were taped, this method would save most instructor time in the long run.

Two experiments were reported utilizing the telephone as an instructional device. Cutler, McKeachie, and McNeil (1958) found no significant differences in achievement between a group taught in a regular classroom and a group taught by telephone, each member in his own home. This method seems exceedingly impractical for general use. However, the Experimental Freshman Year Program utilized the same sort of telephone installation, allowing group interaction, to bring lectures by eminent professors on distant campuses to the experimental group gathered in a classroom. In this special context telephone teaching may have considerable potential. Burkhart (1960) reports on an experiment using telephone instruction as it was used in the Experimental Freshman Year Program. No significant differences in achievement by treatment were reported.

Tape recording of instructional material has been shown to be successful, particularly in language instruction (Carroll, in Gage, ed., 1962) although little research has been done on tape content and form. Popham (1961) found no significant differences in achievement between a group taught conventionally and a group taught by taped lectures followed by brief instructor-led discussions.

In a later experiment Popham (1962) modified his original experimental treatment to include student-led rather than instructor-led discussions, so that students only contact with the instructor was via the taped lecture. Once again, no significant differences were found compared to the conventional teaching method. The author concluded that tape recording is an effective teaching method.

It seems that all the teaching media reported measure their success in terms of no significant differences. If this is true and if electronic teaching devices are fully as effective as live classroom teaching, then they could indeed represent a major gain in presenting quality instruction to large numbers of students at minimum cost. However, long term studies must be made to determine what the longitudinal effects of such methods may be and to discover whether or not satisfactory results will still be obtained if the larger part of the educational experience is by such media, instead of only isolated courses such as research has sampled thus far. Also it must be determined what effects these devices will have upon the marginal student, the low achiever and the under-achievers, before they can be unequivocally accepted.

Summary

A summary of the findings in experimental efforts to improve achievement follows.

1. Remedial teaching programs have had qualified success.
    a. Follow-up studies may show loss of initial gains (Lovell, Byrne and Richardson, 1963).
    b. Remedial reading programs are more valuable for retarded readers who score lowest in verbal ability, since these tests are biased against poor readers (Schneyer, 1963).
    c. Improved attitudes toward reading gained in remedial course may reinforce later independent improvement (Englander, 1960).
2. Freshman core curriculum may improve achievement (Fahey and Ball, 1960).

3. Grouping students by ability level raises achievement for under-achievers but does not affect the group as a whole (Abramson, 1959; Karnes, McCoy, Zehrbach, Wallerscheim and Clarizio, 1963).
    a. Grouping under-achievers in special homeroom in high school for guidance, help in study techniques, and personal counseling results in improved achievement (Passow and Goldberg, 1958).
    b. Grouping under-achievers in classes has negative effect, as students reinforce each other's non-achieving behavior (Passow and Goldberg, 1958).
    c. Groups of non-improving under-achievers can be identified who show large discrepancies between self-estimates of ability and wished-for ability (Passow and Goldberg, 1958).

4. Counseling under-achievers shows successful results.
    a. Short-term (two months) group counseling showed no increase in achievement (Broedel, Ohlsen, Proff and Southard, 1960).
    b. Longer-term group counseling showed significant results on achievement (Eklund, 1957; Spielberger, Weitz and Denny, 1962).
    c. Intensive individual counseling resulted in improvement in achievement (Ivey, 1962; Shouksmith and Taylor, 1964).
    d. No significant differences are found between effect of individual and group counseling (Wright, 1957).

5. Instructor-led out-of-class interviews with students may be moderately successful in raising levels of achievement (Sherriffs, 1949).
    a. Student-centered interviews are more effective than course content-centered interviews (Moore and Popham, 1960).
    b. Interviews may be successful at critical level of passing or failing while showing no effect over whole group (Hoehn and Saltz, 1956).
    c. "Gripe" interviews are beneficial for anxious students but harmful for rigid students (Hoehn and Saltz, 1956).
    d. "Satisfactions" interviews, in which students talk about things which please them, are beneficial to rigid students but do not affect anxious students (Hoehn and Saltz, 1956).

6. Enriched extra-curricular programs are enjoyed by high ability students but do not raise achievement levels (Stamatakos and Shaffer, 1959).

7. Self-ratings on competence in course material at regular intervals during course result in superior achievement (Duel, 1958).

8. Periodic quizzes have a doubtful effect on achievement (Standlee and Popham, 1960).

9. Note-taking after class is just as effective as note-taking during the lecture (Eisner and Rohde, 1959).

10. "Brainstorming" instructions produce greater productivity in creative problem solving than instructions to limit solutions to "good" ones (Parnes and Meadow, 1959).

11. Time of class has no effect on achievement (Sessions and Carruth, 1962).

12. Self-directed study techniques do not raise initial levels of achievement (Blue, 1958; Kersh, 1958; Hovey, Gruber, Terrell, 1963; Ray, 1961).

    a. Temporary improvement in retention of material is gained through self-directed study (Kersh, 1958; Ray, 1961).
    b. This treatment shows no interaction by ability level (Ray, 1961).

13. Programmed instruction yields results in achievement at least equal to conventional teaching methods (Banghart, McLaulin, Wesson, and Pikaart, 1963; Benson and Kopstein, 1961; Calvin, 1960; Collins, 1962; Cronbach, 1962; Ferster and Sapon, 1958; Gotkin and Goldstein, 1962; Hatch, 1959; Hickley and Anwyll, 1961; Hough, 1962a; Hughes, 1961; Klaus and Lumsdaine, 1960; Lewis, 1961; Maier and Jacobs, 1964; Oakes, 1960; Porter, in Galanter, ed., 1959; Reed and Hayman, 1962; Smith and Quackenbush, 1960).

14. Programmed instruction saves instructor and learning time (Ellis, 1962; Ferster and Sapon, 1958; Frye, 1962, Gotkin and Goldstein, 1962; Hough, 1962a, 1962b; Hughes, 1961; Porter, in Galanter, ed., 1959; Silverman, 1963; Smith, 1962; Wendt and Rust, 1962).

15. Programmed instruction does not eliminate under-achievement (Gotkin and Goldstein, 1962; Hough and Revsin, 1963; Hughes, 1961; Keislar, 1959; Lambert, Miller and Wiley, 1962; Maier and Jacobs, 1964; Reed, 1963; Roe, Case, and Roe, 1961; Silberman, 1963).

16. Instructional films do not raise levels of achievement (AERA, 1962).

17. Instructional films may reduce the amount of irrelevant material learned (Deutchmann, Barrow, Jr., and McMillan, 1961, 1962).

18. Televised instruction may result in small losses in achievement (Carpenter and Greenhill, 1955, 1958; Macomber and Siegel, 1957, 1960; Kasten and Seibert, 1959; Seibert, 1957; Throop, Assini, and Boguslavsky, 1958).

19. Telephones may be used for instruction in special circumstances with no loss in learning (Cutler, McKeachie, and McNeil, 1958; Burkhart, 1960).

20. Tape recorded material is valuable in instruction, with no loss in achievement (Carroll, 1962; Popham, 1961).

Academic Achievement and College Admission Policy

The findings and suppositions reported in this chapter represent a survey of the recent literature on matters related to academic achievement on the college level. This section of the chapter deals with the ways colleges and universities are making use of the information which has become available to them, specifically in respect to the matter of admission requirements.

The techniques and problems of prediction are dealt with at length in one of the first sections of this chapter. That earlier section makes clear that even the best predictive measures are far from providing the perfect answer to the question about who shall be admitted to college. Each institution of higher learning must base its own admission program on several considerations: the quality of students desired, the number of applicants, the number of places available, the educational facilities and physical plant available, the type of program provided, and, if it is a state-supported institution, the prevailing attitude in the legislature as to who should be permitted to attend college. Predictive techniques are applicable only to the first of these factors.

Two inexorable facts face all universities. First, a growing discrepancy exists between the number of applicants and the number of places available. Second, advanced training becomes more and more important at all levels of modern society. Oliver (1962) reports that British universities are now beginning to face problems identical to those in the United States and urges that similar measures be taken in England as are in force here. Therefore, the pressure is on most institutions to make the best possible use of all available resources. Colleges and universities concede that facilities for higher learning must be greatly expanded, and many institutions, including Southern Illinois University, are currently engaged in accelerated growth programs. But this is no solution for those who must make immediate decisions on exactly who will make up the entering classes of the coming year.

This section of the chapter contains two main divisions. The first is a collection of proposals on what might be done to alleviate admission and selection problems. The second consists of a very general discussion of the ways in which the many factors pertaining to college admission policies have been handled in a variety of situations. Examples included range from the small state university system, with little over-crowding pressure and with either minimum selection procedures or none, to the very large and well-endowed state system, where rigorous admission criteria are utilized, along with some alternative plan available to the less able students. Intermediate between these two extremes is a compromise technique employed by universities which desire to offer the opportunity for college education to all applicants and yet wish to keep the university standards high. Under this latter plan, all applicants would be admitted, but continuing students would be rigorously selected after completion of one or more terms of college work.

It can be seen that policies and proposals on the problem of admissions vary widely, but seem to fall into two general groups: those whose main emphasis is conserving the universities' resources for students with the greatest possibility of success and not, therefore, wasting them on students who fail; and those who are most concerned with avoiding wasted human talent and making sure that virtually everyone who can possibly succeed has the opportunity to try.

Private institutions generally fall in the first category and state schools into the second, although this is by no means an absolute criterion. Schools where applications many times exceed available spaces necessarily are drawn to the first category, as are state schools in states where the public's trend of thinking favors maintenance of high standards rather than a super-democratic educational policy. But it is safe to say that all schools accept the responsibility of the national educational crisis and that none is willing to remain half empty at the risk of accepting a few potential failures.

Hood and Berdie (1963) offer an encouraging note in their finding that the increased emphasis on higher education has not been entirely non-selective. They found that although state university enrollment in Minnesota has increasec 100 per cent in the last decade, current freshman classes include a much higher percentage, 81 per cent, of high ability students than did the 1950 entering classes, which included a percentage of 67 per cent. It was hoped that the same phenomenon exists as a nationwide trend.

It is also encouraging to read in Dugan's (1960) general review of current university problems that in the face of the critical situation facing the universities, administrative reaction has not been one of withdrawal from the needs of the student population. Great concern is evident for salvaging both students of high potential who do not go to college and those who go but fail to graduate. There is no indication that colleges are "closing their doors" as the alarmist popular press would seem to propose. Rather, efforts are being bent toward the practical yet sympathetic procedure of making most efficient use of existing facilities plus developing special programs for those who are not likely to succeed in or benefit by the general university program.

Suggestions for solving the college admissions problem fall into two main groups. The first group tends to minimize the need for selection, and emphasizes the importance of specializing universities and directing students toward the kind of institutions where they are well suited and, therefore, are likely to be admitted. The second group is concerned with improving selection procedures.

Wescoe (1963) suggests that selection is a good thing only where it is a necessity resulting from pressure from excessive applications. This author proposes that natural selection takes place anyway and concludes that there is no need to devote great amounts of energy and resources to a task which will be taken care of eventually with no efforts. Goren (1962) concurs, noting that many good schools rely on natural selection and that if students would temper their demands on the "prestige" schools, much of the admission crisis would be eliminated.

Several writers stress a kind of non-coercive selection based on developing specialized schools making clear to the prospective student the kinds of abilities and interests likely to be required for success in the particular case. Wilson and Wing (1963) state that it is the responsibility of the president of each institution to establish clearly the educational goals of his school and that admission policies should be tailored to these goals. Wack (1962) suggests that colleges should specialize according to the abilities and interests of the student body and that a unified testing program in the high schools, a program including interest as well as ability measures, would be useful in aiding discriminating guidance making it possible for the student to choose a suitable school.

Fricke (1956) urges the various colleges to make public the specific admission procedures which they employ so that students can be in a better position to assess their own probability of success. This author also suggests that colleges should work toward admitting homogeneous groups, either high or average, so that unified standards can be applied. It is suggested that such a policy would increase the sensitivity of grades so that the full range of a given student's accomplishments could be assessed. Goren (1964) presents a hypothetical "fact sheet" which might be distributed to high school guidance counselors. This "fact sheet" would give a full description of the university and the nature of its campus and student body plus a clear presentation of the levels of ability and previous achievement which, in combination with the specific nature of the college, yield different predictions of success, the latter information being based on performance of previous students.

Schaller (1963) proposes an admissions clearinghouse, in which both students and universities would submit preferential lists and the highest possible choice would be given to each. The purpose of this plan, too, is to provide the maximum amount of information about prospective universities to students in an atmosphere of minimum pressure. The point repeated in all these articles is that specific information for the student about the various universities, plus a re-organization of university goals so that so many are not attempting to fill the same function, will solve most of the problems of selective admissions except for the most desirable and prestigious institutions.

Several articles present suggestions about the manner in which the various items of information available to admissions officers should be used in selection. The emphasis here is on scaling procedures to be applied to the different backgrounds from which students come in order to overcome the unreliability of grades.

Sapienza (1959) suggests that subject material and the previous schools should be weighted, more value being given to grades in academic subjects or to grades from higher quality schools. It is necessary that high schools be rated for this procedure. Aptitude test scores should also be weighted with more credit given for high scores. Sapienza also states that other factors such as work experience or letters of recommendation should be marginal in considering applicants for admission. Chenoweth (1964) suggests that the high school record should be the major factor in consideration for admission only if the high school is known to the admissions officer and can be judged accordingly. Otherwise, aptitude tests should be given greater weight. Fricke (1956) suggests that high school percentile rank be given double weight over ability test scores in selection, since high school rank has been shown to be a more effective predictor.

Fishman (1958) introduces a new concept in selective admissions when he suggests that non-academic criteria be considered in judging applicants for admission. This author contends that a good academic record in college is not the only factor contributing to success in later life but that other developmental changes occur on the college scene which have great significance in the ultimate success of the individual. Fishman holds that success in such things as developing leadership or establishing a sound value system may also be a function of the university and that prediction of success in these non-intellective criteria should have a place in selection for admission. The author discusses this issue at greater length in The American College (1962). Fishman's ideas apparently have not been incorporated extensively in admissions procedures, however. Meade (1962) notes that while non-intellective characteristics are considered by many universities, they are used as admissions criteria only by the most selective, and, even in these, the purpose of selecting by these factors is more for creating a specific social milieu on campus, rather than for insuring the success of the student.

Stout and Halfter (1963) present a proposal for a study planned to determine whether different types of students can be discerned according to which entrance examination they elect to take, independent of the scores which they attain. It is hypothesized that students will fall into distinct groups by this procedure and that these groups will reflect differences in non-intellective qualities which would not otherwise be revealed prior to admission.

The rest of this section deals with studies which compare various admission criteria or report admissions policies used or proposed in different institutions.

Lloyd (1960) reports a survey showing that although common conception has it that all state universities admit any resident high school graduate who applies, only eleven states actually require their universities to do this and ten more do so as matter of policy. This leaves twenty-nine, or almost 60 per cent, which do employ selective admissions criteria.

Danskin and Hoyt (1960) review a study directed toward comparing specific admissions criteria in a state university. An unselected group of students were subjects of the study. At the end of two years of college work the group was examined, and various hypothetical admissions procedures were tested in regard to their power to have selected those who eventually did succeed in maintaining minimum university standards and to have rejected those who eventually failed.

The particular cut-off point eventually recommended for this university with its special student body, testing program, and graduation requirements is not so important, but of more merit is the fact that an effort was made to determine objectively the special needs of the situation and to make decisions on the basis of the findings rather than make an arbitrary choice on the basis of non-applicable norms or on an idea of what seemed attractive.

This study also pointed out that post-admissions criteria, especially first semester GPA, are extremely good predictors, and are much better than any pre-admissions criteria. This kind of selection would seem to be essential for those state universities who must admit all high school graduates and would appear ideal for any other institution which, though not legally bound, wishes to offer maximum opportunity to all students and is able to accommodate a large freshman class.

Berdie (1960) presents another detailed statistical analysis of various selective admissions procedures. His general conclusion reiterates that no method approaches perfection. He notes that although it is possible to reduce failure rates greatly, a significant number of potentially successful students are eliminated at the same time. As Berdie states, the choice eventually depends on the philosophy of the institution in question.

The problems of the state universities are more acute because they must be guided to a great extent by conditions existing in the state. If state standards are low, then the universities cannot rise too far above, if state standards are high, the state universities may come to resemble private insititutions in their standards of selection. Excellent examples of such contrast are the states of West Virginia and California.

Pugh (1960) reports that the universities of West Virginia recently decided that they could no longer continue their policy of admitting all applicants with a high school diploma. Therefore, a college ability testing program was instituted, and it was decided that those students scoring below the twenty-fifth percentile on both the ability test and high school rank should not be admitted.

This stands in strong contrast to California. Smith (1960) reports that the proportion of high school graduates eligible for admission to four-year institutions in this state has now been reduced to one-third of the total number. The University of California, moreover, is even more selective, in that admission is available to only one out of eight California high school graduates. Of course, California has an extensive system of junior colleges, and it is intended that the less able students go to a junior college for their higher education and continue in the regular university only if they can demonstrate their capabilities. Most states, of course, cannot afford this luxury, and many researchers, including Smith, feel that California cannot afford it either. Smith feels that the loss in human potential is not worth the exalted standards of the university.

Goren (1963) reports on a procedure which has been used to a limited extent in New York University. Certain students who were rejected by the college to which they had originally applied were referred to another college in the University, and some were eventually admitted. This implies a differential selection model which might be very useful for large, multi-purpose universities where a single admissions standard might unnecessarily eliminate certain students with special qualifications. It also incorporates a guidance function into the admissions procedure.

The University of Illinois undertook a large scale testing and interviewing program for students graduating in the lowest quarter of their high school class in an effort to discourage poorly qualified students from entering the University. Eells (1961) reports that although the program was successful in showing statistically significant reductions in the number of lowest quarter students entering, reductions could not definitely be attributed to the program, and the small success did not justify the expense.

Actually, the report of the Master Plan Committee of the Illinois Board of Higher Education suggests that Illinois may be headed in a very different direction, one closely resembling the California system. In a preliminary report, one of the sub-committees of the Board of Higher

Education recommends that only students from the upper half of their high school classes be admitted to state universities and that others be directed to junior colleges. It is also recommended that transfer students from junior colleges to the universities be restricted to those who have demonstrated competence in college work.

Thus it appears throughout that as applicant pressure increases, selection becomes more stringent. However, the way is being kept open for the less qualified student to pursue a higher education through the junior colleges. In all, the prospects for the future indicate that most students will still have the opportunity to prove themselves in college work.

Summary

A summary of the findings pertaining to college admission procedures follows.

1. Universities should be specialized to the aptitude and interest needs of students (Wescoe, 1963; Wilson and Wing, 1963; Wack, 1962).
2. Universities should provide information regarding standards and admission procedures to students (Fricke, 1956; Goren, 1964; Schaller, 1963).
3. High school grades should be weighted according to the quality of the high school in order to improve admission criteria (Chenoweth, 1964; Sapienza, 1959).
4. Non-academic criteria of success in college should be considered in admission (Fishman, 1958).
5. Restrictions are minimal in state universities where facilities are not overloaded (Pugh, 1960).
6. State universities may admit anyone where facilities are available and select students after admission on the basis of first term grades (Danskin and Hoyt, 1960).

7. Strict admission policies are in force in California in the state universities, and there is a large system of junior colleges for the less promising high school graduates (Smith, 1960).

8. Most universities which have selective admissions policies use both high school grades and ability test scores as criteria (Danskin and Hoyt, 1960; Berdie, 1960).

9. Selective admissions policies are employed in 60 per cent of all states (Lloyd, 1960).

Attrition in Higher Education

In spite of rapidly increasing national interest in attending college and increasing selectivity in admissions policies, the fact remains that approximately 40 per cent of those who enter college do not graduate. Junior colleges may have an even higher rate of attrition. One report by the Illinois Master Plan Committee (1963) shows that only 22 per cent of the students entering two-year colleges in Illinois in 1958 eventually graduated. It has been suggested that this high drop-out rate is a serious problem for several reasons: First, the loss of potential talent is critical. Second, high attrition is wasteful of already strained university facilities. Third, the drop-out needlessly wastes time and resources in disappointment and failure when the drop-out otherwise might be engaged in satisfying productive activity. On the other hand, it might be argued that this is all part of the democratic process of natural selection since each individual is allowed to determine his future through his own effort. In any case, much investigation has been directed toward discovering the causes for leaving college, the personality or other factors associated with drop-outs, and ways to control attrition. This section of the chapter is concerned with these investigations.

A major portion of research has focused only on the reasons for leaving school given by students at the time of withdrawal. There is considerable agreement among writers from various schools as to the nature of these reasons. Chief among them is undoubtedly academic dismissal or poor grades. Koelsche (1956), Shuman (1956), Cummings (1949), Little (1959), McNeely (1937), Mathews (1956), and Weintraub and Salley (1945) report this finding. Others eliminated this factor from the sample before conducting investigations.

Financial difficulty is another prime reason given for leaving school according to Schnier (1958), Koelsche (1956), Johnson (1954), Shuman (1956), Angers (1961), and Iffert (1957). Two other reasons frequently noted are perhaps associated with financial difficulty. These include leaving to join the military service, a reason found by Iffert, (1957), Koelsche, (1956), Schnier (1958), and Shuman (1956), or leaving to take a job, a cause stated by Shuman (1956) and Angers (1961). According to Shuman (1956) and Koelsche (1956), many women leave to be married. Summerskill and Darling (1955) found that more women than men left for reasons not scholastic in nature, but that there was no difference by sex in total drop-outs.

Angers (1961), Johnson (1954), Shuman (1956), Koelsche (1956), and Gekoski and Schwartz (1961) note what they term a highly significant reason for leaving. This reason may be described as discouragement, lack of interest, general dissatisfaction with school or curriculum, or the feeling that vocational or other goals are not being met.

Factors Associated with Attrition

In spite of these findings, Gekoski and Schwartz (1961), in a study comparing drop-outs to those who persist in college work, report that no actual differences are found in the frequency of the aforementioned personal problems. Therefore, another group of studies concentrates more objectively on factors which can be demonstrated to be associated significantly more frequently with those who leave school than with those who persist.

Grades and Ability. Grades and ability may be factors in voluntary withdrawal, but frequently they exist in interaction with other factors, as low grades and ability are not found in clear-cut association with attrition. Johnson (1954) found that low GPA was associated with withdrawal only for men, while low scores on a reading test discriminated for women. Lins and Pitt (1953) found that a linear relationship does exist between withdrawal and high school rank, *ACE* scores, and first semester GPA. Vorreyer (1963) found that regression equations separately constructed, for men and women, from high school GPA, aptitude scores, and social studies achievement scores, successfully predicted drop-outs, but that no single item could be associated with attrition. Grace (1957) found that achievement test scores are highly correlated with remaining in college. Bragg (1956) found that attrition is associated with lower high school GPA and lower first semester GPA, but not with mathematics ability. Baer (1958) stated that low high school GPA is associated with drop-outs. Johnson and Entwisle (1958) found that the attrition group showed lower scores on an ability test quantitative score, College Board math score, and ability test verbal score.

Two studies were concerned with attrition rates among the lowest third of high school graduates; one, Munger (1954), a study of this group only and the other, Munger and Goeckerman, (1955), comparing the lowest third with the upper third graduates. It was reported that only 9 per cent of the lowest third group eventually graduated, but the drop-outs did not differ from the persisting group on OSPE scores, a reading test, or the Wrenn Study Habits Inventory. In the study comparing the two groups, it was found that OSPE scores made no difference for either group and that first semester GPA was the best predictor for both groups. Interestingly, the lowest third stay-group did no better in first semester GPA than the upper third group which eventually dropped. It was hypothesized that the level of aspiration and resulting satisfaction or disappointment made the difference between the two groups.

Reporting on groups similar to the lowest thirds, Lins and Pitt (1953) report that only eight per cent of students admitted on probation eventually graduated. A study at Southern Illinois University (1964) found that new students admitted on probation showed an attrition loss of two-thirds after three quarters. Transfer students admitted on probation showed somewhat better staying power. Mumma (1950) found that students admitted on the basis of scores on the G.E.D. test have a higher drop-out rate than those with high school diplomas.

Personality. Several writers have investigated the possibility that personality differences are responsible for high incidence of withdrawal. These findings are reported in a variety of terms.

Vorreyer (1963) reports no differences attributable to adjustment, between withdrawing and persisting students, but Brown (1960) found several differences indicative of poor adjustment. On the basis of the Minnesota Counseling Inventory, women drop-outs were found to be withdrawn, introverted, depressed, and socially isolated, while men drop-outs were found to be irresponsible and non-conforming.

Grace (1957) also found attrition to be associated with irresponsibility as well as dependence. But the author found that responsibility is associated with only those staying students who are females. In addition, Grace found that attrition increases with anxiety.

Two studies attempted to evaluate the needs of withdrawing students. Kibrick (1958) found that needs states revealed by withdrawing students were high need for aggression, abasement, deliberation, exposition, and rejection. Staying students showed higher needs for nurturance, achievement, cognizance, conjunctivity, deference, and sameness. Heilbrun (1962), hypothesizing that personality factors are more pertinent for women, used an all female sample and found that the drop-out group showed higher need for hetero-sexuality and change, and lower need for achievement, order, and endurance.

In a study comparing students in remedial reading courses and honors programs, Hinton (1962) attempted to show that highly motivated groups have low attrition rates. It was assumed that both groups would be highly motivated, and it was found that both groups have the same staying power.

Two studies compared persisting and withdrawing groups on vocational interests. Stewart and Roberts (1955) found that drop-outs in a teachers college showed more interest in persuasive fields, while staying students showed more interest in mechanical and outdoors fields. Johnson and Entwisle (1958) found no significant differences between groups on the Kuder.

Curriculum. Some writers have looked for an association between differing attrition rates and curriculum. Slater (1960) found that persistence is higher in vocationally oriented colleges than in liberal arts colleges. The author hypothesizes that the clear association with vocational goals is responsible for higher persistence levels. It was also found that persistence is higher for those who are in fields which are oriented in terms of values in the same way as the fathers' occupations. Presumably students in familiar fields show greater persistence than those in strange fields. Long and Perry (1953), on the other hand, found that although just as many freshmen who entered the various curricula eventually graduated, more students transferred out of technological curricula prior to graduation.

Recommendations for Reducing Attrition

Several writers offer various suggestions about ways to reduce drop-out rates. As evidenced by Baer (1958), Iffert (1957), Frederiksen (1963), Shuman (1956), Heilbrun (1962), Lins and Pitt (1953), and Gekoski and Schwartz (1961), it is universally noted that most drop-outs occur in the freshman year; therefore, many of the suggestions are aimed at freshman students.

Chambers (1961) suggests that freshmen should all take a standard core curriculum of basic subjects, the curriculum varying only on the basis of previous preparation. This first term would enable students to make the transition from high school to college before they get involved in more advanced work, would insure that most students would have the basic skills necessary for college work, and would provide a sound basis for choice of a major field. It is proposed that all these factors would act to reduce attrition.

Frederiksen (1963) sees the drop-out problem as essentially the problem of making the difficult transition from the over-protective high school to the indifferent college. This author urges that both institutions should work to alleviate the problem. The high schools should encourage independence in students and not be so willing to pass students who are doing failing work, while college teachers should make a special effort to organize lectures and present subject matter in a way which will be comprehensible to the freshman with no previous experience in the field.

Shuman (1956) reports several factors which seem to hold potential drop-outs. These are out-of-school employment, extra-curricular activities, school spirit, out-of-school activities, definite career plans, and a desire to finish. Some of these could be approached by guidance counseling and some by an activities program.

Any program directed specifically toward the attrition group of course depends on the ability to recognize this group before withdrawal. Since prediction of voluntary withdrawals at this time does not seem practicable, perhaps greater attention should be focused on improving the performance and satisfaction of the student body as a whole.

Summary

A summary of the findings in college attrition follows.

1. Making poor grades is one of the main reasons for leaving school before graduation (Cummings, 1949; Koelsche, 1956; Little, 1959; McNeely, 1937; Mathews, 1956; Shuman, 1956; Weintraub and Salley, 1945).
2. Factors associated with financial difficulty are frequently reported as reasons for withdrawing from school (Angers, 1961; Iffert, 1957; Johnson, 1954; Koelsche, 1956; Schnier, 1958; Shuman, 1956).
3. Discouragement, dissatisfaction, and lack of interest are often reported as reasons for withdrawing from school (Angers, 1961; Gekoski and Schwartz, 1961; Johnson, 1954; Koelsche, 1956; Shuman, 1956).
4. Students withdrawing from school do not actually differ from persisting students in frequency of personal problems (Gekoski and Schwartz, 1961).

5. Grades and ability are negatively associated with attrition (Johnson, 1954; Lins and Pitt, 1953; Vorreyer, 1963; Grace, 1957; Bragg, 1956; Baer, 1958; Johnson and Entwisle, 1958; Munger, 1954; Munger and Goeckerman, 1955; Mumma, 1950).
6. No acceptable conclusions can be derived from existing research on the personality of drop-outs (Vorreyer, 1963; Brown, 1960; Grace, 1957; Kibrick, 1958; Heilbrun, 1962; Hinton, 1962; Stewart and Roberts, 1955; Johnson and Entwisle, 1958).
7. Attrition rates may be higher for students enrolled in certain curricula (Slater, 1960; Long and Perry, 1953).
8. Most attrition occurs by the end of the freshman year (Baer, 1958; Iffert, 1957; Frederiksen, 1963; Shuman, 1956; Heilbrun, 1962; Lins and Pitt, 1953; Gekoski and Schwarts, 1961).
9. A basic standard college freshman curriculum may reduce attrition (Chambers, 1961).
10. High schools should encourage independence in students (Frederiksen, 1963).
11. College teachers should attempt to organize material in a way comprehensible to freshman (Frederiksen, 1963).
12. Activities programs may reduce attrition (Shuman, 1956).

Abstract of Findings

This abstract represents a consolidation of the most salient facts or implications contained in the great variety of research reviewed in the preceding chapter. It is intended that this condensation will provide an overview of research progress, problems and deficiencies, and a brief integrated picture of the outstanding characteristics typical of under-achievers.

Identifying Over- and Under-Achievers

There are several important problems in identifying groups of under-achievers.

1. Different statistical procedures, given the same data, select different groups of over- and under-achievers (Farquhar and Payne, 1964).

2. Different criterion measures (e.g., grade point average or achievement tests) select different groups of over- and underachievers (Pippert and Archer, 1963).

3. Measurement problems affecting discrimination of underachiever groups are statistical measurement error, regression effect, and heterogeneity of criterion measure (GPA from different colleges, fields of study, etc.).(Thorndike, 1963).

4. Intellectual ability is not a homogeneous factor; different ability patterns yield differences in achievement, total ability being held constant (Gunderson and Feldt, 1960; McDonald, 1964; Sanders, Mefferd, Jr., and Bown, 1960).

5. Researchers often do not report sample selection procedures, a factor which prevents replication and systematic study of selection problems (Farquhar and Payne, 1964).

Predicting Achievement

6. College entrance examinations and/or ability tests are valuable predictors of success in college (Juola, 1960; McCormick and Asher, 1964).
    a. Some tests are more effective for a given university than others.
    b. Some tests are more effective for a given high school sample than others.
    c. Some tests predict better for males than females or vice versa.
    d. Sub-scores from the different areas sometimes make better predictors than total scores for achievement or for students with limited educational backgrounds.

7. High school GPA is the most effective single predictor (Boyce, 1963; McCormick and Asher, 1964).
    a. High school GPA is a better predictor for students from large high schools than students from small high schools.
    b. Selected high school course grades are often better predictors than total GPA.

8. High school rank is a good predictor but it is biased in favor of small schools (Boyce, 1963).

9. Several non-intellective predictor scales (usually based on attitudes toward school) are being developed and have proved only moderately successful in predicting college GPA (Anderson, 1964; Brown and Abeles, 1960; French, 1963; Hackett, 1960; Juola, 1963).

10. Under-achievement or discrepancy scores make good predictors (Froelich and Mayo, 1963).

11. The best predictors are multiple regression models constructed from a combination of the best predictors available (McCormick and Asher, 1964; Watley, 1964).

    a. Increased measurement error may make addition of too many variables inadvisable.
    b. The most effective regression models must be determined for each individual sample.

12. The best predictors available generally do not exceed r = .75 (Boyce, 1963).

Factors Related to Achievement and Under-Achievement

General Factors and Achievement

13. Under-achievers have a strong tendency to continue to under-achieve (Carter and McGinnis, 1952; Diener, 1960; Dowd, 1950; Frankel, 1960; Knaak, 1957; McQuary, 1953; Pearlman, 1952; Schmelzlee, 1964; Shaw and Brown, 1957).

14. Under-achievement usually begins very early in grade school for boys, somewhat later for girls (Carter and McGinnis, 1952; Dowd, 1952; Lambert, 1963; Shaw and McCuen,.1957.

15. Females, on the whole, achieve better than males (Carter and McGinnis, 1952; Dowd, 1952; Lambert, 1963).

16. Teachers have a tendency to discriminate against boys in the early grades (Lambert, 1963; McNeil, 1964).

17. Teachers have a tendancy to prefer the conforming student (Lambert, 1963).

18. Under-achievers identified by GPA do not under-achieve on achievement tests (Knaak, 1957; Malpass, 1953; Pippert and Archer, 1963; Shaw and Brown, 1957).

19. Achievers have more positive attitudes toward school than under-achievers (Dowd, 1952; Gerberich, 1941; Malpass, 1953).

20. Study habits may be positively associated with achievement (Diener, 1960; Dowd, 1952; Gerberich, 1941; Lum, 1960).

21. Under-achievers show greater vocational interest in applied science, sales, and business contact fields; achievers show greater interest in research science fields (Diener, 1960; Frankel, 1960).

22. Under-achievers are found in academic programs inconsistent with their interests more frequently than achievers (Dowd, 1952; Armstrong, 1955).

23. Reading ability may have a positive effect on achievement (McQuary, 1954).

Creativity and Achievement

24. The correlation between creativity and intelligence is probably not as low as was originally proposed (Banghart and Spraker, 1963; Trabue, 1962).

25. Teachers prefer highly intelligent to highly creative students (Getzels and Jackson, 1962).

26. High creativity may be a marginal factor contributing to under-achievement (Pippert, 1963; Getzels and Jackson, 1962; Torrance, 1963).

27. There is little evidence that highly creative students perform better in situations where creativity is stressed (Banghart and Spraker, 1963; Yamamoto, 1963).

Motivation and Achievement

28. Motivation is probably the single most important non-intellective variable accounting for residual variance in achievement (Brown, Abeles, and Iscoe, 1960; Heilbrun, 1963; Lowell, 1952; Weiss, Wertheimer, and Groesbeck, 1959).

29. There are important differences in the motivational patterns of males and females. These sex differences are great enough to have obscured the findings of any motivational research which does not control for sex. (Heilbrun, 1963; Weiss, Wertheimer, and Groesbeck, 1959).

30. The Edwards Personal Preference Inventory is probably the most efficient and reasonably valid scale extant for measuring motivation (Weiss, Wertheimer, and Groesbeck, 1963).

31. External manipulation of level of aspiration or task-specific motivation may be effective in raising levels of achievement (Kausler, 1959).

Personality and Achievement

32. Under-achievers are more frequently extraverts and over-achievers are more frequently introverts (Blackham, 1955; Beach, 1960; Duff and Siegel, 1964; Heston, 1947; Lynn, 1960; McKenzie, 1964; Owens and Johnson, 1949; Savage, 1962).

33. Some evidence suggests that under-achievers may have a tendency toward neuroticism (Blackham, 1955; Savage, 1962).

34. Under-achievers are less mature than achievers (Morgan, 1952; Powell and Jourard, 1963).

35. Work is under way in developing a behavioral rating scale for measuring personality (Gendlin, 1961; Tomlinson, 1959).

Anxiety and Achievement

36. Anxiety probably affects achievement negatively to a significant degree in certain circumstances, but the effect is confounded by interaction with other variables, such as motivation, ability level, and social class, so that research results are not definitive (Grooms and Endler, 1960; Malnig, 1964; Phillips, 1962; Spielberger and Katzenmeyer, 1959; Wrightsman, 1962).

Adjustment and Achievement

37. Some writers report that under-achievers are maladjusted, while others report no significant differences in the adjustment for under-achievers (Blackham, 1955; Frankel, 1960; Griffiths, 1945; Horrall, 1957; Hoyt and Norman, 1954).

    a. The source of the contradiction is probably inadequate operational definition of the term adjustment.
    b. Conflicting findings suggest that the effect of adjustment on achievement, if it indeed exists, is probably not severe.

Demographic Factors and Achievement

38. Under-achievers are found with greater relative frequency in private schools and military academies than in public schools (Finger and Schlesser, 1963; Weitz and Wilkinson, 1957).

39. High school size does not affect achievement (Lathrop, 1960; Uhlinger and Stephens, 1960).

40. High school course pattern (academic versus non-academic) is very significantly related to achievement (Lathrop, 1960).

41. High school size significantly determines course pattern (Lathrop, 1960).

42. Urbanism is positively associated with achievement up to population 500,000. In larger cities the relationship disappears (Washburne, 1959).

Family and Parent Attitudes and Achievement

43. Under-achievers do not differ significantly from achievers on family size, parental education and occupation, sibling patterns, and frequency of family problems (Carter and McGinnis, 1952; Dowd, 1952; Frankel, 1960; French, 1959; Myers, 1952; Schoonover, 1959; Shaw and Brown, 1957; Weigand, 1957).

44. Under-achievers have more negative attitudes toward their families and family problems than do achievers (Weigand, 1957).

45. Reports on the effects of parent attitudes on under-achievers are conflicting, but sketchy patterns suggest that parents of achievers give positive direction and selective discipline to their children while parents of under-achievers are either very permissive or very autocratic (Drews and Teahan, 1957; Shaw and Dutton, 1962; Teahan, 1963; Weigand, 1957).

Economic Status and Achievement

46. Socio-economic factors have little or no general effect on achievement, but may interact with other variables to produce an effect in specific instances (Brockington and Stein, 1963; Curry, 1962; Knief and Stroud, 1959; Washburne, 1959).

47. Socio-economic status may have an effect in selecting which students will go on to college (Brockington and Stein, 1963; Washburne, 1959).

48. Systematically deprived cultural groups show lower scores on achievement tests than the general population (Rupiper, 1963).

Experimental Treatments and Achievement

49. Remedial teaching programs have had qualified success.

    a. Follow-up studies of remedial programs may show loss of initial gains (Lovell, Byrne, and Richardson, 1963).

   b. Remedial reading programs are more valuable for retarded readers who score lowest in verbal ability, since these tests are biased against poor readers (Schneyer, 1963).
   c. Improved attitudes toward reading gained in remedial course may reinforce later independent improvement (Englander, 1960).

50. Freshman core curriculum may improve achievement (Fahey and Ball, 1960).

51. Grouping students by ability level raises achievement for under-achievers but does not affect the group as a whole (Abramson, 1959; Karnes, McCoy, Zehrbach, Wallerscheim and Clarizio, 1963).

   a. Grouping under-achievers in special homeroom in high school for guidance, help in study techniques, and personal counseling results in improved achievement (Passow and Goldberg, 1958).
   b. Grouping under-achievers in classes has negative effect, as students reinforce each other's non-achieving behavior (Passow and Goldberg, 1958).
   c. Groups of non-improving under-achievers can be identified who show large discrepancies between self-estimates of ability and wished-for ability (Passow and Goldberg, 1958).

52. Counseling under-achievers shows successful results.

   a. Short-term (two months) group counseling showed no increase in achievement (Broedel, Ohlsen, Proff and Southard, 1960).
   b. Longer-term group counseling showed significant results on achievement (Eklund, 1957; Spielberger, Weitz, and Denny, 1962).
   c. Intensive individual counseling resulted in improvement in achievement (Ivey, 1962; Shouksmith and Taylor, 1964).
   d. No significant differences are found between effect of individual and group counseling (Wright, 1957).

53. Instructor-led out-of-class interviews with students may be moderately successful in raising levels of achievement (Sherriffs, 1949).

   a. Student-centered interviews are more effective than course content-centered interviews (Moore and Popham, 1960).
   b. Interviews may be successful at critical level of passing or failing while showing no effect over whole group (Hoehn and Saltz, 1956).
   c. "Gripe" interviews are beneficial for anxious students but harmful for rigid students (Hoehn and Saltz, 1956).
   d. "Satisfactions" interviews, in which students talk about things which please them, are beneficial to rigid students but do not affect anxious students (Hoehn and Saltz, 1956).

54. Enriched extra-curricular programs are enjoyed by high ability students but do not raise achievement levels (Stamatakos and Shaffer, 1959).

55. Self-ratings on competence in course material at regular intervals during course result in superior achievement (Duel, 1958).

56. Periodic quizzes have a doubtful effect on achievement (Standlee and Popham, 1960).

57. Note-taking after class is just as effective as note-taking during the lecture (Eisner and Rohde, 1959).

58. "Brainstorming" instructions produce greater productivity in creative problem solving than instructions to limit solutions to "good" ones (Parnes and Meadow, 1959).

59. Time of class has no effect on achievement (Sessions and Carruth, 1962).

60. Self-directed study techniques do not raise initial levels of achievement (Blue, 1958; Kersh, 1958; Hovey, Gruber, and Terrell, 1963; Ray, 1961).

    a. Temporary improvement in retention of material is gained through self-directed study (Kersh, 1958; Ray, 1961).
    b. This treatment shows no interaction by ability level (Ray, 1961).

61. Programmed instruction yields results in achievement at least equal to conventional teaching methods (Banghart, McLaulin, Wesson, and Pikaart, 1963; Benson and Kopstein, 1961; Calvin, 1960; Collins, 1962; Cronbach, 1962; Ferster and Sapon, 1958; Gotkin and Goldstein, 1962; Hatch, 1959; Hickley and Anwyll, 1961; Hough, 1962a; Hughes, 1961; Klaus and Lumsdaine, 1960; Lewis, 1961; Maier and Jacobs, 1964; Oakes, 1960; Porter, in Galanter, ed., 1959; Reed and Hayman, 1962; Smith and Quackenbush, 1960).

62. Programmed instruction saves instructor and learning time (Ellis, 1962; Ferster and Sapon, 1958; Frye, 1962; Gotkin and Goldstein, 1962; Hough, 1962a, 1962b; Hughes, 1961; Porter, in Galanter, ed., 1959; Silverman, 1963; Smith, 1962; Wendt and Rust, 1962).

63. Programmed instruction does not eliminate under-achievement (Gotkin and Goldstein, 1962; Hough and Revsin, 1963; Hughes, 1961; Keislar, 1959; Lambert, Miller and Wiley, 1962; Maier and Jacobs, 1964; Reed, 1963; Roe, Case, and Roe, 1961; Silberman, 1963).

64. Instructional films do not raise levels of achievement (AERA, 1962).

65. Instructional films may reduce the amount of irrelevant material learned (Deutchmann, Barrow, Jr., and McMillan, 1961, 1962).

66. Televised instruction may result in small lossessin achievement (Carpenter and Greenhill, 1955, 1958; Macomber and Siegel, 1957, 1960; Kasten and Seibert, 1959; Seibert, 1957; Throop, Assini, and Boguslavsky, 1958).

67. Telephones may be used for instruction in special circumstances with no loss in learning (Cutler, McKeachie, and McNeil, 1958; Burkhart, 1960).

68. Tape recorded material is valuable in instruction, with no loss in achievement (Carroll, 1962; Popham, 1961).

Admissions

69. Universities should be specialized to the aptitude and interest needs of students (Wescoe, 1963; Wilson and Wing, 1963; Wack, 1962).

70. Universities should provide information regarding standards and admission procedures to students (Fricke, 1956; Goren, 1964; Schaller, 1963).

71. High school grades should be weighted according to the quality of the high school in order to improve admission criteria (Chenoweth, 1964; Sapienza, 1959).

72. Non-academic criteria of success in college should be considered in admission (Fishman, 1958).

73. Restrictions are minimal in state universities where facilities are not overloaded (Pugh, 1960).

74. State universities may admit anyone where facilities are available and select students after admission on the basis of first term grades (Danskin and Hoyt, 1960).

75. Strict admission policies are in force in California in the state universities and a large system of junior colleges for the less promising high school graduates (Smith, 1960).

76. Most universities which have selective admissions policies use both high school grades and ability test scores as criteria (Danskin and Hoyt, 1960; Berdie, 1960).

77. Selective admissions policies are employed in sixty per cent of all states (Lloyd, 1960).

Attrition

78. Poor grades are among the main reasons for leaving school before graduation (Cummings, 1949; Koelsche, 1956; Little, 1959; McNeely, 1937; Mathews, 1956; Shuman, 1956; Weintraub and Salley, 1945).

79. Factors associated with financial difficulty are frequently reported as reasons for withdrawing from school (Angers, 1961; Iffert, 1957; Johnson, 1954; Koelsche, 1956; Schnier, 1958; Shuman, 1956).

80. Discouragement, dissatisfaction, and lack of interest are often reported as reasons for withdrawing from school (Angers, 1961; Gekoski and Schwartz, 1961; Johnson, 1954; Koelsche, 1956; Shuman, 1956).

81. Students withdrawing from school do not actually differ from persisting students in frequency of personal problems (Gekoski and Schwartz, 1961).

82. Grades and ability are negatively associated with attrition from school (Johnson, 1954; Lins and Pitt, 1953; Vorreyer, 1963; Grace, 1957; Bragg, 1956; Baer, 1958; Johnson and Entwisle, 1958; Munger, 1954; Munger and Goeckerman, 1955; Mumma, 1950).

83. No acceptable conclusions can be derived from existing research on the personality of drop-outs (Vorreyer, 1963; Brown, 1960; Grace, 1957; Kibrick, 1958; Heilbrun, 1962; Hinton, 1962; Stewart and Roberts, 1955; Johnson and Entwisle, 1958).

84. Attrition rates may be higher for students enrolled in certain curricula (Slater, 1960; Long and Perry, 1953).

85. Most attrition occurs by the end of the freshman year (Baer, 1958; Iffert, 1957; Frederiksen, 1963; Shuman, 1956; Heilbrun, 1962; Lins and Pitt, 1953; Gekoski and Schwartz, 1961).

86. A basic standard college freshman curriculum may reduce attrition (Chambers, 1961).

87. High schools should encourage independence in students (Frederiksen, 1963).

88. College teachers should attempt to organize material in a way comprehensible to freshmen (Frederiksen, 1963).

89. Activities programs may reduce attrition (Shuman, 1956).

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